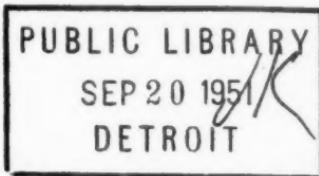


TECHNOLOGY DEPT.

THE JOURNAL OF

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Vol. 30, No. 9, September 1951



SPECIAL CONFERENCE ISSUE

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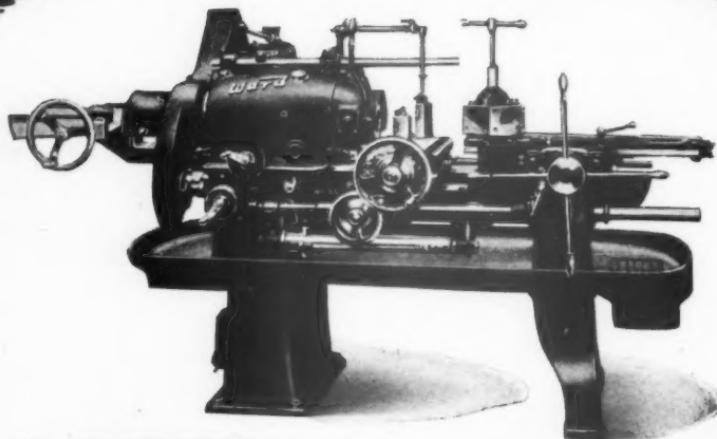
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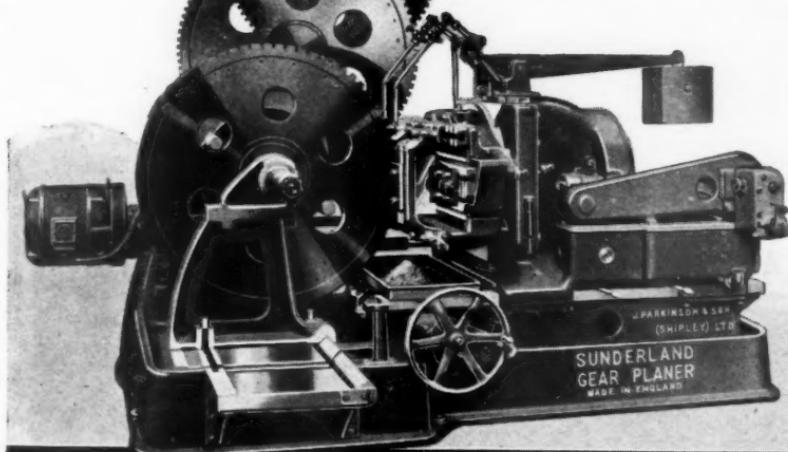
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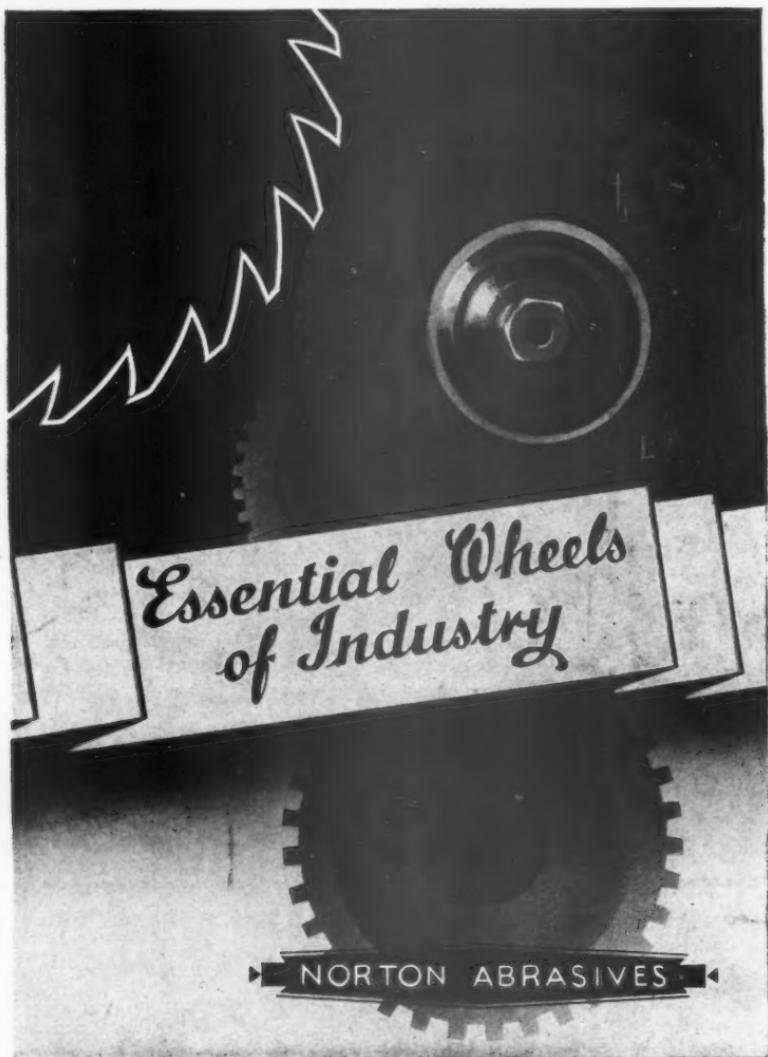
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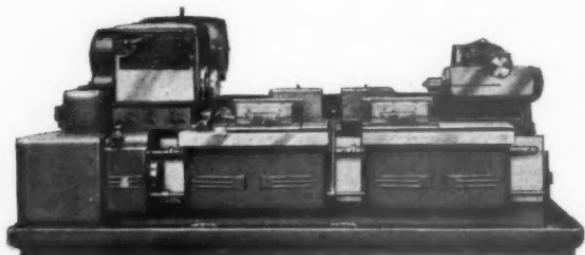
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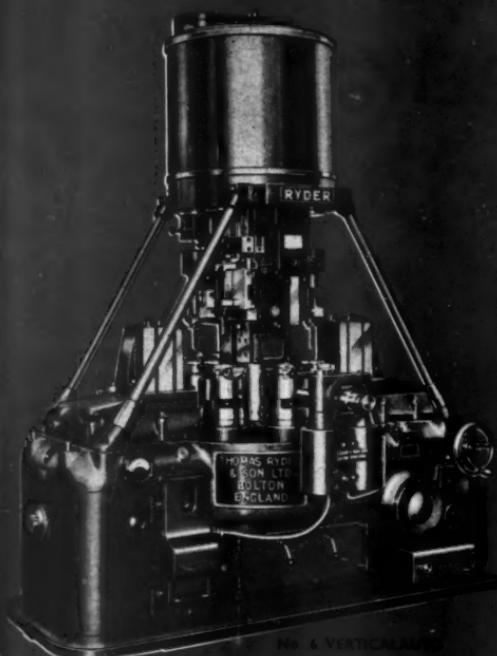


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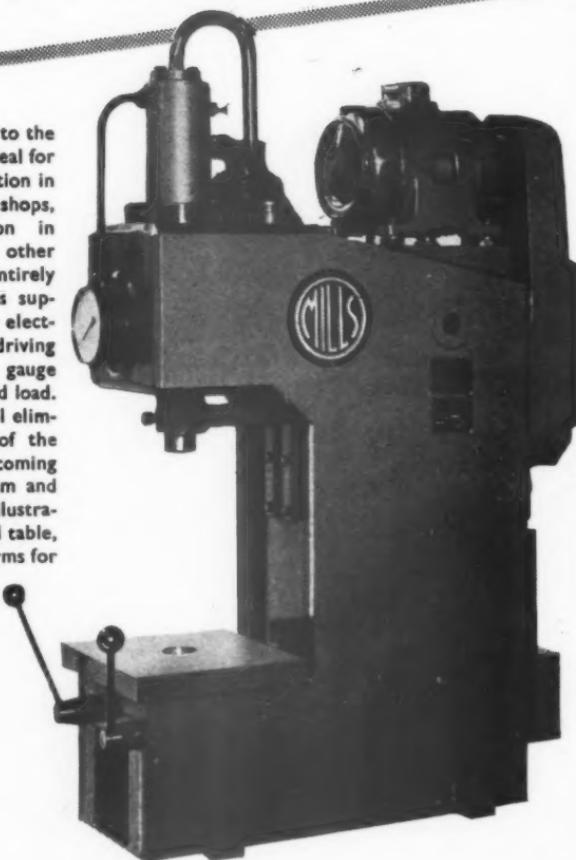


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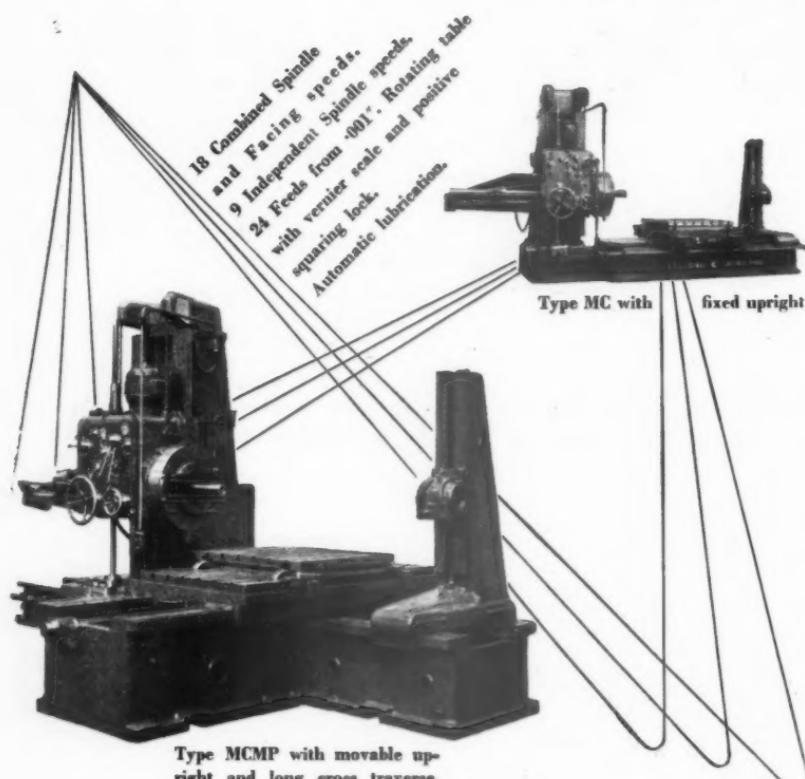
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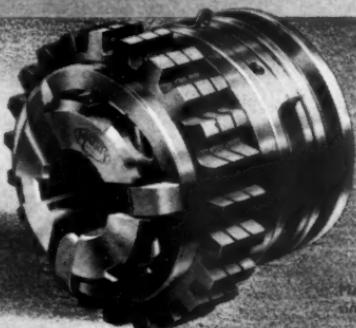
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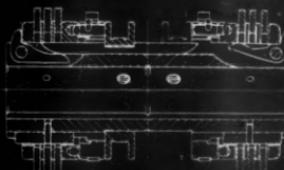
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THE JOURNAL OF

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Vol. 30, No. 9, September 1951



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SCHOFIELD TRAVEL SCHOLARSHIP, 1952

THE Institution is pleased to announce that applications are now invited for the 1952 Schofield Travel Scholarships.

It is intended to offer two scholarships for 1952, which will entitle the successful Graduates to visit selected European countries for industrial study visits of six months duration. Each scholar will have an opportunity of carrying out his project in one or more firms.

Objects of the Scholarship Scheme.

- (i) To provide facilities whereby young production engineers are given an opportunity of broadening their outlook, and of improving their knowledge of production functions, both technical and managerial.
- (ii) To improve productivity in this country by the implementation and dissemination of such knowledge.
- (iii) To stimulate interest in production by offering these facilities.
- (iv) To help to foster a better understanding of the modes of life, social conditions, and, in particular, of the production methods employed in the industries of the United States of America, European countries, and such other countries as may from time to time appear desirable.

Conditions for the 1952 Scholarship

- (i) Two Scholarships will be offered, covering a period of six months. Council reserve the right to make no award if the entries are not considered to be of sufficiently high standard.
- (ii) Graduates entering for the scholarship must have attained their 23rd birthday, but not have passed their 30th birthday, on the 1st January, 1952. No graduate who was elected after 1st January, 1951, will be accepted as a candidate.
- (iii) Application forms may be obtained from the Head Office of the Institution, and should be completed and returned by candidates not later than 15th October, 1951.
- (iv) Successful candidates will be required to devote the whole of their time abroad to the project which they have selected. On their return they will be required to read a paper in their Sections, and to report on their projects in any other way which may be considered desirable by the Institution.
- (v) Graduates entering for the award this year who are unsuccessful, may enter again for future awards, subject to the particular conditions then in force.

Selection Procedure.

- (i) Preliminary selection will be carried out by Section Committees, who will take into consideration reports submitted by employers and educational establishments.
- (ii) Candidates who satisfy these preliminary selection Committees will proceed to the next stage, which involves the preparation of a paper on the project which they propose to carry out if awarded a scholarship.

Such papers should include a detailed background of the candidates' knowledge and experience, which they consider will enable them to make a profitable investigation of their selected subjects.

The projects should have a direct bearing on production, and in particular on that aspect of it with which the candidate is concerned at the time of entering for the award.

- (iii) After assessment of the papers submitted, certain candidates will be selected to attend a final group interview.

It is important to note that at all stages of the selection procedure the personal qualities of Candidates will be given equal consideration with their academic and industrial attainments.

INSTITUTION NOTES

September, 1951

PUBLICATION OF CONFERENCE PROCEEDINGS

In view of the large amount of valuable and interesting material which has resulted from the Harrogate Conference, it has been decided to publish the report in two consecutive issues of the Journal instead of in only this issue as previously announced. This issue of the Journal, therefore, contains full reports of the addresses by His Grace the Lord Archbishop of York ; Mr. Hamilton Walter, Sir Norman Kipping, Mr. Lincoln Evans and Sir Ewart Smith ; and the October Journal will contain the ten Discussion Group Papers and reports, and the Conference Summing-up by the Chairman of Council.



Lt.-Col. L. Urwick, O.B.E., M.C.

AN OUTSTANDING AWARD

On Wednesday, 11th July, 1951, at Brussels, the Gold Medal of the International Committee of Scientific Management was presented to Lt.-Col. L. Urwick, O.B.E., M.C., M.I.Prod.E. This Gold Medal is a coveted honour and is awarded only for an outstanding contribution in the management field. There have, so far, been six recipients and this is the first time it has been presented to a British subject.

MATERIALS HANDLING CONFERENCE, BIRMINGHAM, 9th JUNE, 1951

This highly successful Conference, organised by the Birmingham Section, was attended by nearly 500 delegates and was held at the Castle Bromwich Works of Fisher & Ludlow Ltd. by courtesy of the Chairman and Directors.

After the formal opening of the Conference by the President of the Institution, Major-General K. C. Appleyard, C.B.E., T.D., D.L., J.P., and an introductory talk by Mr. Bernard Deakin, Transport Manager of Fisher & Ludlow Ltd., the delegates were conducted on various tours of the Works.

THE INSTITUTION OF PRODUCTION ENGINEERS



Delegates attending the Birmingham Materials Handling Conference have lunch at Fisher and Ludlow's Castle Bromwich works.



Professor J. R. Immer speaking at the Birmingham Materials Handling Conference. From left to right : Major-General K. C. Appleyard, President of the Institution ; Professor Immer ; Mr. H. Burke, Vice-Chairman of Council : Mr. O. J. B. Orwin ; Mr. Frank Griffiths ; M. L. J. Hoefkins.

HARROGATE CONFERENCE

After lunch, where members were welcomed by Mr. Arthur Keats, O.B.E., Chairman and Managing Director, the afternoon was devoted to lectures and discussions. The Speakers were Professor J. R. Immer, M.Sc., B.A., A.I.Prod.E., who spoke on "American and British Handling Methods"; Mr. Frank Griffiths, A.M.I.Prod.E., Chief Planning Engineer of the Austin Motor Co., whose subject was "Inter-Process Mechanisms," and Mr. L. J. Hoekens, Stores Controller, Lockheed Hydraulic Brake Co. Ltd., who discussed "Some Effects of Modern Material Handling Methods on Stores Administration."

COURSES IN MANAGEMENT STUDIES

The North-Western Polytechnic announces the commencement of a number of courses in Management Studies. One series of full-time courses, each of a month's duration, is concerned with the Human Aspects of Management, and is designed for experienced persons concerned with supervision of staff or general personnel administration. Subjects covered include Psychological Background, Authority and Responsibility, Management Qualities, Industrial Relations, Clear Communications, Selection and Training, Work Environment, Security and Morale, and Incentives.

The fee for the complete course is £3, and commencing dates are 24th September, 22nd October (for office executives), and 19th November, 1951.

The College has also arranged courses in Management Studies in preparation for the Common Intermediate Certificate in Management Studies (to holders of which the I.Prod.E. grants certain exemptions) including a part-time day and evening two-year course (which may be taken at any time), and a three-year course covering evenings only, for which enrolment must be made between 17th/21st September next. The fee for either course, for students residing or working in the London area, is 35/-.

Further particulars and prospectus are available upon application to the Head of the Department of Commerce and Professional Studies, North-Western Polytechnic, Prince of Wales Road, London, N.W.5.

A NEW FILM STRIP

It was announced in the June, 1951, issue of the Journal that Film Strips on aspects of Production Engineering are being produced, for distribution by Messrs. Dance-Kaufmann, Upper Stanhope Street, Liverpool. In addition to the strip entitled "Rough Forging to Finished Part," a further strip dealing with the essentials of Materials Handling is now available.

THE INSTITUTION OF PRODUCTION ENGINEERS

This strip sets out in simple terms the essential factors in the approach to problems of Materials Handling, and it is hoped to follow this with a second strip showing how these fundamentals are applied in practice.

A copy of the strip is available for inspection in the Hazleton Memorial Library.

NEWS OF MEMBERS

Mr. A. J. Beanland, B.Sc. Tech., Associate Member, has been appointed Assistant General Manager of the Trafford Park Works of Lancashire Dynamo & Crypto (Mfg.) Ltd.

Mr. A. G. Bloomer, Associate Member, has now taken up the position of General Manager of O. Atkinson & Sons, Ltd., Harrogate.

Mr. C. H. Codling, Associate Member, is now Assistant Works Manager, Mechanical Department, Nigerian Railway, Lagos.

Mr. R. F. Cook, Member, is now General Works Manager to the Wipac Group of Companies at Bletchley, Bucks.

Mr. M. Dempsey, Associate, is now Works Manager of Durham Industries (Canada) Ltd., Montreal.

Mr. A. E. Edwards, Associate Member, has now taken up the position of Assistant Technical Sales Manager with the Manganese Bronze and Brass Co. Ltd., ("Oilite" Division), Ipswich.

Mr. Kenneth J. Hume, B.Sc., Member, has been appointed Head of the National College of Horology and Instrument Technology, accommodated at the Northampton Polytechnic, London.

Mr. E. J. Newman, Associate Member, has taken a post as Tool Designer with De Havilland Aircraft of Canada, Ltd., Toronto.

Mr. Frederick A. Rose, Associate Member, has been appointed Naval Armament Production Officer to the Armament Supply Department, Admiralty, for the Birmingham area.

Mr. L. J. Service, Associate Member, is a Lecturer at Newport Technical College.

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Mr. G. Stowe, Associate Member, has been appointed Training Engineer to the Plessey Co. Ltd., Ilford.

Mr. B. E. Terry, Associate Member, has been appointed Senior Executive in charge of Engineering with E. K. Cole, Ltd. (Plastics Division).

Mr. V. J. Vaughan, Associate Member, has been appointed to the Board of Multi-Spring Mattresses, Ltd., London.

Mr. J. E. Witts, Associate Member, is Works Manager at the Spennymoor factory of the Ferguson Radio Corporation, Ltd.

Mr. S. Worne, Member, is now a Director of the Chandos Engineering Co. Ltd., Egham.

Mr. E. Bernheim, Graduate, has been appointed Assistant Engineer at Thames Plywood Manufacturers, Ltd., Barking, Essex.

Mr. F. A. S. Gilmore, Graduate, is employed as Technical Adviser at Wickman, Ltd., Coventry.

Mr. R. D. Guthrie, Graduate, is now Chief Time Study and Methods Engineer with Jury Hollowware, Ltd., Brierly Hill.

Mr. B. Hill, Graduate, is now a Production Engineer with Textile Machinery Makers, Oldham.

Mr. H. B. Lee, Graduate, is now an Aircraft Design Technician with "Pilatus" Flugzeugwerke A.G., Switzerland.

Mr. F. Whitaker, Graduate, is a Jig and Tool Draughtsman with the Distinguon Engineering Co., Ltd., Workington.

BRITISH STANDARDS The following Standards have recently been issued, and may be obtained post free at the prices stated, from the British Standards Institution, 24/28, Victoria Street, Westminster, London, S.W.1 :

- 1713 : 1951 Cast Iron Smooth Tube Economisers with Pressed Socket Joints (2/-).
1740 : 1951 Wrought Pipe Fittings, Iron and Steel—Screwed B.S.P. Thread (5/-).

HAZLETON MEMORIAL LIBRARY

The following publications have recently been received and are available to members. It would be helpful if the volume classification number could be quoted when borrowing books.

ABSTRACTS**621.775 POWDER METALLURGY**

Goetzel, Claus G. "Treatise on Powder Metallurgy," Vol. II, "Applied and Physical Powder Metallurgy." N.Y., Interscience Publishers, 1950. 910 pages. Illustrated. Diagrams.

This extensive book is divided into two sections : (1) Applied Powder Metallurgy, (2) Physical Powder Metallurgy.

The first section includes chapters on Refractory Metals and Alloys, Hard Metals and Compositions, Electrical and Magnetic Materials, Ferrous and Non-Ferrous, and Porous and Friction Products. Information is given on manufacturing methods, powder preparation, various compositions, and industrial applications. The effect of variables on the physical and manufacturing properties is noted.

The second section includes chapters on Stress Analysis and testing methods for sintered metals, and an extensive survey in the form of brief synopses of the various theories of the bonding sintered metals. There are many graphs, tables, and diagrams, and references to interesting developments in this country and abroad.

621.793 METAL COATING PROCESSES

"International Conference on Hot Dip Galvanizing." Copenhagen, 1950. An Account of the proceedings, with revised texts of the papers presented and of the discussions on them. Oxford, Hot Dip Galvanizers Association. 1951. 161 pages. Illustrated. Diagrams.

This volume contains the record of the first International Conference on Hot Dip Galvanizing, held in Copenhagen in July, 1950.

This was attended not only by senior technicians from all the firms using the galvanizing process in this country, but also by scientists including Dr. Martin Hughes (British Iron & Steel Research Association), who is continually engaged in research on this type of work.

The subjects are logically and fully discussed, including research reported upon by such important workers as Fagg (British Nonferrous Metals Research Association) and Babilik, whose published works are world-famous ; the Influence of Aluminium on the Alloying Action, reported upon by Hughes, and Galvanizing Residuals and their Treatment, reported upon by Bailey (Zinc Development Association). The discussions are also included. A table is given on the performance of galvanizing baths, giving all the necessary variables associated with the technique, the research extending over 10 baths galvanizing almost every form of appropriate metal product.

A paper on "The Future of General Galvanizing" was contributed by Stubbs, who suggested that the process is now the most economical long-term protection for steel. He outlines possible rivals to galvanizing and gives their various merits ; these include zinc spraying, zinc plating (electro galvanizing), sherardizing, and aluminium coatings. Altogether this is one of the most complete records of the galvanizing process that has ever been published.

HARROGATE CONFERENCE

621.83 GEARS

Admiralty-Vickers Gearing Research Association. "Report No 1 : The Erection of the Craven 21 ft. Gear Hobbing Machine at Messrs. Vickers-Armstrong's Limited, Barrow." Barrow-in-Furness, the Association. 1951. 18 pages. Photos. Drawings.

The erection of a large gear hobbing machine is described in great detail in this report of the AVGRA. A brief description of the machine itself is given first, followed by an illustrated section dealing with foundations in various stages of construction. The erection of the machine is dealt with next, followed by an extensive description of the methods and equipment used in checking levels, alignments and working accuracy of the machine and its constituent parts. Results of this inspection are given in 26 appended Shop Inspection Reports. Finally, conclusions are drawn and recommendations made for future work, based on the experience gained in the task forming the subject of this report.

621.9 MACHINE TOOLS

Town, H. C. "Technology of the Machine Shop." London, Longmans Green & Co. 1951. 366 pages. Illustrated. Diagrams.

Machine Tools and Plant Layout in the Workshop—Metal Removed by Cutting and Grinding—Design and Construction of Machine Tools with Reference to Vibration—Calculations for Machine Stability and Balance—Tooling Equipment and Jig Boring, Jigs and Fixtures—Centreless Grinding—Automatic Sizing During Grinding. Surface Finish Measurements by Talysurf and Plastic Replica Process—Diamond Boring and Milling—Honing and Lapping—Broaches and Broaching Operations. Some Results of Machine Tool Research Experiments—Machine Tool Alignment Tests. Illustrations clear and profuse.

621.94 LATHES, SCREW MACHINES

Petermann, Joseph Ltd. Moutier, Switzerland. "Operator's Handbook for Petermann P 7 Automatic Screw Machine." 2nd Ed. Moutier, the Firm. [195?]. 156 pages. Illustrated. Diagrams.

Although this book is entitled "Operator's Handbook," the range of information of the Petermann P 7 Automatic Screw Machine will be useful to all technical staff who are concerned with this machine. For the draughtsman, there are dimensional details of all the replaceable items such as tools, collets, bushes, knurl and die holders and circular form tool holders. This eliminates the inconvenience of making these parts to sample. Cam calculations are fully explained. In addition to the information on the calculation of cams, a section of the book is devoted to the making and measuring of these items, and is illustrated with photographs and diagrams.

The Time Study and Production Control departments are catered for with the sections on Production Calculations and Operation Charts.

All adjustments are explained diagrammatically and instructions given for operating and maintaining the Machine.

621.795 FINISHING

"Industrial Polishing of Metals" by Gerald F. Weill. Iliffe & Sons, Ltd., London. 194 pages.

A brief historical review is followed by the theory of reflecting surfaces, after which is given the procedure for polishing various metals, the resultant surface conditions being illustrated by several plates to magnification $\times 1500$. Various compositions and equipment used are fully dealt with, as are auto and electrolytic processes. Dust extraction, safety and costing conclude the work.

OTHER ADDITIONS

331.1 PERSONNEL MANAGEMENT

- British Institute of Management, London. "Labour Turnover." *Lond., The Institute.* 1950. 11 pages. (Personnel Management Series 1.)
 Institute of Personnel Management, London. "Preparing an Employee Handbook," by E. Farmer and others. (Rev. Ed.) *Lond., The Institute.* 1949. 35 pages.
 Institute of Personnel Management, London. "Selection and Placement." *Lond., The Institute.* 1949. 52 pages.
 National Institute of Industrial Psychology, London. "Bibliography of

331.152 CO-OPERATIVE ADMINISTRATION ; JOINT CONSULTATION

- Industrial Supervision.*" 1950. 24 pages.
 Institute of Personnel Management, London. "Joint Consultation : A Practical Approach." *Lond., The Institute.* 1950. 47 pages.
 British Institute of Management, London. "Wage Incentive Schemes." (2nd Ed.) *Lond., The Institute.* 1950. 26 pages. (Personnel Management Series 3.).
 Gracie, J. J., and others. "Job Evaluation." *Lond., B.I.M.* 1949. 34 pages. (Conference Series 5.).
 Mallon, J. J. "Industry and a Minimum Wage ; [with] Universities and Management," [by] Lord Lindsay of Birker. *Lond., B.I.M.* 1950. 23 pages.
 Northcott, C. H. "Wages." (Rev. Ed.) *Lond., Institute of Personnel Management.* 1949. 39 pages.

658.54 TIME AND MOTION STUDY

- Sylvester, L. Arthur. "Handbook of Advanced Time-Motion Study." *New York, Funk & Wagnall* in association with *Modern Industry Magazine.* 1950. 273 pages.

658.562 INSPECTION ; QUALITY CONTROL

- Thompson, James E. "Inspection Organization and Methods." *New York, McGraw-Hill.* 1950. 369 pages. Illustrated. Diagrams. (Industrial Organization and Management series.).

658.7 BUYING ; STORING

- Bromell, John R. "Effective Use of Wholesale Drug Warehouses." *Washington, Gov. Pr. Office.* 1947. 81 pages. Illustrated. Diagrams. (U.S.A.—Dept. Commerce—Industrial series No. 68.).
 Meserole, William H. "Streamlined Grocery Wholesale Warehouses." *Washington, Gov. Pr. Office.* 1945. 96 pages. Illustrated. Diagrams. (U.S.A.—Dept. Commerce—Industrial series No. 18.).

658.8 MARKETING

- Redmayne, Paul and Weeks, Hugh. "Market Research." (2nd Ed. Rev. and Rewritten by R. N. Wadsworth and B. D. Copland. *Lond., Butterworth.* 1951. 195 pages. Diagrams.

659. ADVERTISING

- British Institute of Management, London. "Advertising—A Tool for Management." *Lond., The Institute.* 1950. 33 pages. (Marketing and Sales Management series.).

660. INDUSTRIAL CHEMISTRY

- Rumford, Frank. "Chemical Engineering Operations : An Introduction to the Study of Chemical Plant." *Lond., Constable.* 1951. 376 pages. Illustrated.

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669.71 ALUMINIUM

- Aluminium Development Association, London. "Introduction to Aluminium and its Alloys." Lond., The Association. 1951. 57 pages. Illustrated. Diagrams. (A.D.A. Information Bulletin No. 1.).
Iliff, E. D. "The Steel Shortage : Can Aluminium Help ?" 4 pages. Illustrated. (Metal Industry, Nov. 26, 1948.).
Northern Aluminium Company Limited, London. "Aluminium Windows." Lond., The Company. 1950. 12 pages. Illustrated.
Northern Aluminium Company Limited, London. "Heat Treatment of Aluminium Alloys." Lond., The Company. [n.d.] 55 pages. Illustrated. Diagrams.
Northern Aluminium Company Limited, London. "Noral Aluminium Conduit." Lond., The Company. 1949. 12 pages. Illustrated.
Northern Aluminium Company Limited, London. "Noral Data Sheet with General Notes on Aluminium and its Alloys." Lond., The Company. 1949. 6 pages. Folding.

676.84 BOXES AND CARTONS

- Rigid Boxes and Cartons Productivity Team. "Rigid Boxes and Cartons: Report of a Visit to the U.S.A. in 1950." Lond., Anglo-American Council on Productivity for the Team. 1951. 38 pages. Illustrated. Diagrams. (Productivity Team Report.).

677.66 KNITTING

- Hosiery and Knitwear Productivity Team. "Hosiery and Knitwear: Report of a Visit to the U.S.A. in 1950." Lond., Anglo-American Council on Productivity for the Team. 1951. 52 pages. Diagrams. (Productivity Team Report.).

914.2 GREAT BRITAIN—DIRECTORIES

- "Engineer—Directory and Buyers' Guide." (1950 Ed.) Lond., The Engineer. 320 pages.
"Engineering Directory, 1950-1951." Lond., Engineering. 208 pages.
"Power Transmission Directory and Trade Names Index, 1950-1952." (8th Ed.) Lond., Trade & Technical Press. 281 pages.

THE LIBRARY Members are asked to note that until further notice the Library will not be open on Wednesday evenings or Saturday mornings, but will be open between 10 a.m. and 5.30 p.m. from Monday to Friday each week.

JOURNAL BINDERS Members are reminded that binding cases for the Journal are obtainable from Head Office, price 7/6 each post free. The cases, each of which will hold 12 issues of the Journal, are made of stiff board covered with imitation leather cloth, with gilt lettering on the spine.

CHANGE OF ADDRESS It would be of great assistance to Head Office if members would ensure that the business addresses contained in their records were up-to-date, and would notify Head Office as soon as possible of any change of appointment.

THE INSTITUTION OF PRODUCTION ENGINEERS

RESEARCH PUBLICATIONS A number of copies of the following Research publications are still available to members, at the prices stated :

Report on Surface Finish, by Dr. G. Schlesinger	15/6
Machine Tool Research & Development	10/6
Practical Drilling Tests	21/-
Test Charts for Machine Tools, Parts 3 and 4	5/6 each

These publications may be obtained from the Production Engineering Research Association, "Staveley Lodge", Melton Mowbray, Leics.

ISSUE OF JOURNAL Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

IMPORTANT In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

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INSTITUTION OF PRODUCTION ENGINEERS

CONFERENCE

HARROGATE

28th JUNE - 1st JULY

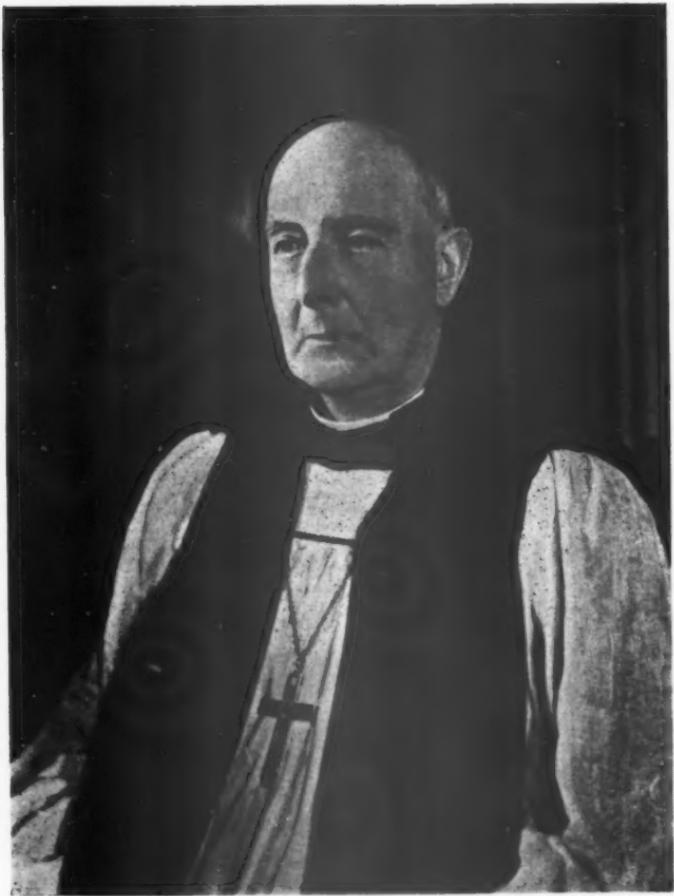
1951

MAIN THEME :

HOW TO FACILITATE THE INTRODUCTION
OF IMPROVED METHODS INTO INDUSTRY

SUB-THEMES :

- (a) "How to apply, for the betterment of all, the techniques and procedures developed by the best British Factories."
- (b) "How to implement the main recommendations in the Reports of the Teams of the Anglo-American Council on Productivity."



The Most Rev. and Right Hon. C. F Garbett, P.C., D.D.
Lord Archbishop of York.

CONFERENCE DINNER, 28th June, 1951

Address by
THE ARCHBISHOP OF YORK
on

"The Moral and Ethical Responsibilities of Industrial Leaders."

THE Conference Dinner, which was attended by 385 members and guests, was held at the Hotel Majestic, Harrogate, on Thursday, 28th June. Major-General K. C. Appleyard, C.B.E., T.D., D.L., J.P., President of the Institution, occupied the chair.

The Loyal Toast having been honoured, His Grace the Lord Archbishop of York (The Most Rev. and Right Hon. C. F. Garbett, P.C., D.D.) proposed the toast of 'The Institution of Production Engineers.'

He said : " You have done me a great honour in inviting me to propose this toast and to speak to you this evening. As I look at your programme, I see that you have indeed a very heavy time in front of you. Tomorrow you will be working intensively, and overtime. I am relieved, however, to see that there are possibilities of relaxation offered to you by Harrogate in the form of entertainments so that if your technical discussions become too weighty there is always the possibility of escape—though I know that the President will denounce me for saying so.

" You have, however, done something very dangerous in inviting me to speak to you this evening, for in the first place I know nothing whatever about engineering or machinery and very little about production. I am not mechanically minded. Incidentally, this will save you from the danger of my attempting to speak to you about matters with which you are very familiar and about which I know nothing. You have exposed yourselves, however, to another and a greater danger. I have been given a subject ; I was asked to speak on the spiritual aspect of your work, and my subject is the moral and ethical responsibilities of industrial leaders. The danger is obvious ; I am accustomed to preaching sermons, and you are in danger of finding yourselves let in for 'Firstly,' 'Secondly,' 'Thirdly,' 'Lastly,' and 'One word more.'

" I shall do my best to spare you that ; nevertheless, I shall not give you those delightful and carefully prepared impromptus which are usual on an occasion like this and I shall do my best to speak to my subject. If, however, some of you feel that this is rather too heavy a subject for an after-dinner speech, please do not put all the blame on me !

**BENEFITS OF
INVENTION**

"Although, as I have said, I know nothing about machinery, I nevertheless realise what great benefits have been brought to this country and to the world through invention, machinery and increased production. The change in our mechanical outlook in the last sixty or seventy years has been amazing. Let me give you one simple illustration. Over fifty years ago, when I was an undergraduate, if I wanted a book on machinery—which I never did—and went to my bookseller, I should probably have found a few books on an out-of-the-way shelf. I went into that same bookshop a few weeks ago and I found not a bookshelf but a whole department, a large room, set apart for books dealing with various technical subjects. That is simply an illustration of the way in which, within a comparatively short time, the nation has become technically minded, and the younger generation at any rate is immensely interested in anything to do with machines and inventions.

"There is no doubt that machines have brought great benefits. They have brought within the reach of the multitude what at one time were regarded as luxuries only within the reach of the few. Mechanical organisation and invention have brought to people greater happiness, greater leisure, greater opportunities. On the other hand we have to recognise that there is another side to this, for, if an age of machinery and invention has brought great blessings, it has also brought great dangers. The roads, for instance, are much more dangerous to life today than they were in the days of the highwayman. There are dangers from the air never dreamed of by our forefathers. I do not think, however, that mediaeval man would have been in the least surprised to see a car or an aeroplane ; he would have been frightened, but not surprised. He would simply have said : 'Of course, I knew that there were dragons on earth and dragons in the sky, and now I see the dragons approaching me, and I must get to a place of safety as soon as possible.' The change, however, compared not only with mediaeval times but with comparatively recent days, has been nothing less than a revolution, due to the development in mechanics.

"There are some who are so conscious of the dangers which have been brought to the world by modern inventions, and especially the dangers threatened by the atomic bomb, that they say quite seriously : 'Invention has gone far enough ; let us stop inventing and be content with what we have.' That is rather in the spirit of the people whom Samuel Butler described in his very remarkable book *Erewhon*, written some seventy years ago. Those who have read that book will remember how a traveller found himself in a strange land, and in this strange land the people regarded ill-health as the greatest of all evils and the greatest of all sins. A person who suffered from illness was brought before the courts and severely

punished, possibly even by death. The other great offence in that country was to introduce any form of machinery. The narrator describes how he was searched on his arrival, and a very serious view was taken of him when it was discovered that he had a watch. He found that many years before there had been a great agitation against machinery, and eventually laws were passed which made a clean sweep of all machinery which had not been in use for more than 271 years—the one was put in as a compromise between those who favoured machinery and those who were against it. The law went on to forbid all further improvements and inventions, under pain of being considered in the eyes of the law to be labouring under typhus fever, which they regarded as one of the worst of all crimes.

THE RIGHT USE OF MACHINERY

" We are not likely to accept the laws of *Erewhon*, nor is it practical to suggest that man's inventive genius should come to an end. As long as man has inventive powers he will use them ; as long as man has the desire for knowledge he will express this desire in practical inventions. What is really necessary is to see that the inventions which are made and the machinery which is used are all used rightly and not wrongly.

" This brings me to my text, which I have already given you. What is the right use of machinery and invention ? What is its purpose ? We know what its immediate purposes are. The immediate purpose of invention is more production, greater efficiency, greater wealth, the earning of more dollars—and we need them in this country. But, behind all that, what is the real purpose of life—if you like to put it in that way—or of the machine ? The true purpose of all inventions ought to be that men and women living together in fellowship may be able to make the very best use of their lives. Behind all the secondary and immediate purposes of invention and machinery there ought to be the supreme purpose, that it should all be used so that man, the individual man, may realise more fully all his capacities and make the very best use of life.

" If that is so—and I believe that it is so—this places very great responsibility on those who, in the subject which has been given to me, are described as the industrial leaders. I hope they will forgive me if I speak of matters which are really elementary, but it seems to me that there are two or three responsibilities which rest especially on those who have great industrial responsibilities. First of all, they must regard the people with whom they are working and who are working under them as persons and not as numbers. The great tragedy of the Industrial Revolution was that during that Revolution men and women were regarded merely as cogs in a vast industrial machine, as instruments and means and not as ends in themselves ; and there fell on the country the appalling suffering which led afterwards to such deep class divisions.

" Today it is increasingly recognised that those who are engaged in any kind of work must not be regarded as instruments or ' hands,' but as human beings who can give active and intelligent co-operation in the work in which they are engaged. In a totalitarian State, the first question which will be asked of an individual will be ' What is your number ? ' but in a State which is based on Western civilisation the question will be ' What is your name ? ' A name always means personality.

CO-OPERATION WITH THE INDIVIDUAL " The best machinery in the world and the most recent methods of work will fail to gain their full result without the intelligent and willing co-operation of the men and women engaged in it. Increasingly, this is the case in all industries. In the last century there was a danger of man becoming part of the machine, becoming himself mechanised, but today man is making human the machine. I have been tremendously impressed, during the nine years or so I have been in the North, when visiting a large number of the large industries, to see all the care that is taken in so many of them, and in all the best of them, for the welfare of those who are working there, to see the recreation and education which are provided and that increasingly, through joint committees and so on, the workmen's intelligence is being called into active co-operation in the work of production. There we have one of the greatest of the tasks recognised fully as such by industrial leaders, the task of obtaining increasing co-operation and intelligent help from the men engaged in their works.

SENSE OF RESPONSIBILITY " The second duty, I think, is to encourage the sense of responsibility. If I were asked what I look on as one of the greatest defects of our time, I would say that it was fear of responsibility. There are large numbers of people who want posts of responsibility, but they are not always, when they get them, prepared to exercise that quality ; they like the prestige, but they fear the responsibility. I am certain that a great deal of the delay which we so often find in getting business done is due to the fact that an application for a licence, or whatever it may be, has to go to an individual and, if it is the least bit out of the ordinary, it goes to somebody else and then to somebody else and then to somebody else, until it has reached a sufficiently high stage to be sent back to the original applicant with the information that he has not filled it up properly. It then goes again along the same road, and by the time it reaches its final destination either the work will have been done, legally or illegally, or it will be too late to do it.

" I think that a good deal of that is due to hesitation in taking responsibility. People are afraid of making a mistake, and that if

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they make a mistake it will stand in the way of promotion ; there may be a letter of complaint, or a letter in the Press or, worst of all, horror of horrors, a question may be asked in Parliament.

" This fear of responsibility is, I am certain, hindering production and activity in various directions. The wheels of life are being choked with red tape. If you have people who are trained to take responsibility, we shall escape many of these delays. I remember that during the war, after a very severe raid in the south of England, I congratulated a Minister on the way in which his representative had acted so promptly, when elsewhere there had not been the same alacrity. He said to me : ' I always tell my representatives " If there is a crisis you must act ; if you make a mistake I will stand by you, but if you do not act you will get the sack." ' That was very good and healthy advice. It is most important to train more people to accept responsibility.

**WELFARE
OF THE
COMMUNITY**

" The third point that I would make in connection with the moral and ethical responsibilities of production, is that behind the needs and claims of the particular industry there must always be kept in mind the needs of the whole community. It is very easy for any one of us to have departmental interests, and for our interests to be confined to one perhaps rather narrow sphere. That may happen to all of us, whatever our profession may be, and it is vital that we should remember the claims of the whole community. That may mean that sometimes we may have to abandon courses which would be advantageous to the industry concerned, but not advantageous to the whole community. It means that in our work we must not only have our own industry in mind, but also have regard to the welfare of the whole of the rest of the community.

" I am sure that today there is very great need to emphasise this. We are passing through an extremely anxious crisis ; a great many people are still quite ignorant of the gravity of the economic crisis. Prices go up, and then wages go up, and then prices go up again, and so we go more and more rapidly towards inflation. Moral qualities are required here ; we need the moral qualities of restraint in asking for increased wages and increased profits, and the moral qualities of hard work for the sake of production. These are essential if the nation is to come safely through this economic crisis. It is not sufficient, therefore, for us merely to have our thoughts on the particular industry in which we are interested ; we must think, as I know that you do, of fellowship and of the claims of the whole nation, of the community of which we are members.

" I told you that I should avoid preaching a sermon, but it would be wrong for me to end without expressing my convictions. I do not believe that we shall get this deep sense of community, with

all the unselfishness for which it calls, until we realise once again that over all nations and over all individuals there is the sovereignty and fatherhood of God, and that each industry and each nation is called on to make its own special and distinctive contribution towards the building up of the welfare of that family of which we are all members.

" It is with very great pleasure that I now have the honour to propose the toast of 'The Institution of Production Engineers.' "

Response by the President

The President of the Institution, who responded, said : " I start my reply to this toast with the delightful conviction that you certainly will not expect from me a speech of the quality of that to which you have just listened. I was reminded a little, while the Archbishop spoke, of what Shakespeare says in Richard III—

' Now is the winter of our discontent
Made glorious summer by this sun of York.'

After the winter that we have had, and after the spring, and after the depression which the Press and radio thrust on us so consistently, Dr. Garbett has lifted our minds to some of those fundamental things which we must not forget and on which the hope of the world rests. He has spoken to us of decency in human behaviour, example from those set in high places whose responsibility it is to lead, understanding and generosity between man and man and between nation and nation.

**A UNIQUE
HONOUR**

" I think that this Institution has been honoured tonight in a unique manner for a scientific and technical body, and I know that you will want me immediately to tell the Archbishop how much we thank him for coming among us and inspiring us, so that when we separate and go our ways in a day or two to our many different tasks we may feel refreshed by this evening, and perhaps, if we carry this evening with us, we may find that our minds are attuned to even greater responsibilities than those technical ones to which we shall devote our attention tomorrow and on Saturday.

" I cannot, of course, add anything to what His Grace has said about the human factor in industry. I have often thought how much I learnt of this particular aspect of industry during the course of one of my pre-war tasks, which was centred in the very city from which the Archbishop takes his title. As some of you know, for five or six years before the war I was Chairman of what is known as the Central Conference of the Engineering Industry, which exists to settle disputes between engineering employers and the trade unions

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**Major-General K.C. Appleyard, C.B.E., T.D., D.L., J.P.
President of the Institution.**

where there has been a failure to settle them in the districts in which they arose. There were thirty or forty engineering unions involved in these arrangements, and these cases were often very difficult.

"In my experience, the human factor almost invariably lay at the root of the cause of every dispute. In the settlement of them, as between the leaders of the unions and the employers present, this human factor—although settlements were based on written agreements—was at the back of the minds of both parties as they strove to find some way out of their difficulties. I remember very few cases where a square deal was not accepted gladly by both sides, except occasionally where perhaps the origin of dispute was best forgotten and the whole thing allowed to lapse.

"During those years, as well as many years before and after, I got to know the leaders of the trade unions very well indeed. I was in the most intimate contact with them all the time, and I still think that in my own make-up a great deal of what I regard with satisfaction came from those men, because I learnt from them of their own human difficulties, their own problems, and in private discussion I saw the other side of some of these cases presented in a way in which they would never be presented to the general public. If for that reason alone, I am particularly glad that at this Conference we are going to have with us Mr. Lincoln Evans, who is such a distinguished representative of those trade unions.

**GROWTH OF
THE INSTITU-
TION**

"The toast proposed by the Archbishop is that of the Institution, and it too is a little like a human being. It was conceived and born about thirty years ago ; it went through the stages of childhood under the guiding hands of its parents, then on to the confidence of young manhood, and today has reached the form of maturity represented by those to whom the approach of early middle-age is in the immediate offing. I say only 'the approach,' because I do not believe that this Institution is yet even in the early days of middle age. It has managed to set up house, and it is even toying with the idea of a larger one. Its family is growing, and getting on towards the 9,000 mark. It has been through the usual financial difficulties of those who are faced with a constantly rising cost of living, and has had to meet those difficulties by asking the family for a little more in the way of contributions, but it is now living within its income and even considering the provision of a little luxury for its brethren here, including those from overseas whom we are so glad to see with us.

"Let me tell you about one or two of these proposed luxuries. The Chairman of Council is here tonight, and I hope that he will not mind my giving away some of the secrets of Council.

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**ESTABLISHMENT
OF INSTITUTION
PAPERS**

" Being a technical body, it is establishing this year two Institution Papers to be prepared and read by selected individuals of distinction, to commemorate —no, that is a bad word, because neither of the gentlemen concerned is dead ! let me say to perpetuate —the names of two of its former Presidents and benefactors. One of these papers will be called the Lord Nuffield Paper—Lord Nuffield is a man to whom this Institution owes so much—and the other, the Sir Alfred Herbert Paper. The gentlemen who are selected to read these papers, and who by doing so will be honoured, will receive some permanent memento of the occasion, which we hope will be one of great distinction in their eyes.

**AN OVERSEAS
SCHOLARSHIP**

" In addition to the two travelling scholarships of which you all know, and which are named after my distinguished predecessor, Dr. Schofield, who is present this evening, it is proposed to arrange a scholarship which will allow one of our overseas brethren to come here and do some work with us, see us at home, and take back to his own Dominion the story of what we are doing here.

**APPOINTMENT
OF TECHNICAL
OFFICER**

" If Mr. Woodford does not mind my referring to his department as the " domestic service department," we have felt for some time the lack of a domestic servant in the shape of a Technical Officer, a technical man who will devote his time to the many aspects of technical work which are involved. Such a man, we believe, can be of tremendous use both to the members of this Institution and, if I may say so with some feeling, to those responsible for the administration of [the Institution. We believe that the appointment of such a man is now almost at the stage of becoming a matter of practical politics.

" All families, if they grow to very large size, have to consider the relations of the members of the family with each other. Sometimes family relations are not very good, and members are apt to criticise each other for the way in which the family fortunes are disposed. We therefore set up a special committee under the guidance of Mr. Burke, with some colleagues whom we selected because they had fresh ideas on how this Institution should be run—very fresh, I understand some of them are! They are thinking about how the structure of our household can be improved, and we hope by the end of the year to have something from them which will be encouraging, especially to the younger members of the Institution.

**THE INSTITUTION
DINNER**

" Again, once every year we try to get our family to dine together. This year we are going to dine together on 2nd October. Our guest of honour is going to be my old friend Mr. William R. Herod who was until

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recently President of the International General Electric Company of America. He is here as Co-ordinator of Defence Production of the North Atlantic Treaty Powers, and no man could have a more difficult and responsible task. He has been good enough to say that he will come and be our principal guest and talk to us on that evening.

**A NEW
INSTITUTION
AWARD**

" This Institution has many friends who have been generous to us with gifts of money, service and, above all, their friendship. While I am not going to trespass on the toast which Mr. Armstrong will propose later, I do want to pay a special tribute to our American friends. We are sorry that Mr. Batt is not here tonight, but we know very well the demands on a man who is carrying such great responsibilities, and we are very happy indeed that Mr. Walter, who is Mr. Batt's assistant, has stepped into the breach and taken his place. I have been sitting nearer to Mrs. Walter than to Mr. Walter, and I can tell you that I am extremely happy to have her here ! I should like to mention in particular one of our other American friends. He is not here—to my disgust, and I know to his—but he feels so cordially towards this Institution that he has told me of his desire to institute an award for it. He is Mr. Barry Benson, and to many of us he is well known as the Commercial Attaché of the American Embassy. In due course he hopes that his award will be called the American Commercial Attaché's Award, and so form a permanent record not only of his own friendship for our country and our Institution, but also a permanent link between our two countries, whose production efforts have been so intimately linked during two wars and during this curious period of defence against war. We hope that for all time to come their production efforts will be linked together in time of peace, to make the world a better place. This is not the time to refer any further to this award, but one of these days we shall be able to tell the donor in more measured terms how grateful we are for his thought. Most of you will not have known of it, however, and I had hoped to tell you about it in his presence.

**MESSAGE FROM
LORD SEMPILL**

" The reply to this toast can very seldom take the form of a humorous or flippant after-dinner speech. Since on this evening we have a bevy of ladies here, who are interested in the Institution but who will not want to listen to long and serious speeches about it, I am not going to ask them to listen to a serious speech much longer. I should like to conclude, however, by reading first of all a cable which has been received from South Africa, from Lord Sempill, one of our Past-Presidents and one of the fine members of this Institution :

" " Please pay my humble duty to my Lord Archbishop, begging his indulgence for enforced absence. Our country and the U.S.A.

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and others with like ideals are holding the Christian front against Communist aggression. We do not require a new order, but the unflinching determination to practise and apply the Christian way of life. We Production Engineers are privileged to be shown the way by the Most Rev. Prelate of Eboricum.'

"We are at the opening of a Conference which I believe to be of considerable importance. We are honoured by a list of very distinguished speakers for our Plenary Sessions, and we owe a tremendous debt of gratitude to the members and staff of the Institution who planned this Convention, and who, as His Grace said, are going to work very hard indeed tomorrow and on Saturday as Chairmen, Rapporteurs, Secretaries and organisers of the various Groups. We can assume in advance that they are going to do their work well, and in the name of the Institution it is not only a duty but a real joy for me to offer to all of them, in the name of the Institution, our thanks for what they have done and for what they are going to do.

"I welcome you all to Harrogate, and I hope that you will have an enjoyable and useful time. To you, my Lord Archbishop, I once again repeat the thanks which I have already expressed on behalf of everybody here. We all hope that you will take away with you the feeling that you have made a great many new friends, a great many more friends to add to your already long list, whose cordial goodwill you will always take with you."

D. Herbert Schofield, C.B.E., Past-President of the Institution, then proposed the toast of

"The Mayor and Corporation of Harrogate"

He said : "I esteem it a great privilege and a particular honour, as a Yorkshireman, to have the opportunity of proposing this toast. In my youthful days in Halifax—as a lad in Halifax, I should say in this gathering—we used to think Harrogate a very great place. It was the *rendezvous* of foreign notabilities, royalties and the grandes of this country. They came, officially at any rate, to partake of the waters. I do not suppose that they actually did so but they enjoyed the beauties of this town.

"I think that we should pay a tribute to the Early Victorians of Harrogate for their wisdom in laying out this town as they have done, with its beautiful Stray, excelled by no city in the country, which is a marvel of planning, and its magnificent Valley Gardens, which are well worth seeing—though only the ladies will have time to see them. When we contrast what these early citizens of Harrogate actually did with what is now done by the 'Cuthberts' who sit in London with a drawing board and attempt planning, so-called, we realise something of our present-day difficulties. I have had a

good deal to do with town and country planning, and the general answer that I get when I have made practical suggestions is "No." They seem to have borrowed it from Molotov. They plan for what is going to happen in the year 2000 and for what is going to be done by people yet unborn, but if you want to do something now, the answer is usually 'No.' The City Fathers of Harrogate many years ago, however, knew what they wanted and did it, and when you walk round this town you see the results before you today.

THE PREMIER CONFERENCE IN THIS TOWN " Harrogate has changed since then, and has now become the Conference town *par excellence* in this country. The Deputy Mayor—we are all sorry that the Mayor cannot be present—says that they had 92 conferences during the past year, including Sanitary Inspectors, Fire Brigades, Rotary and even the Savings Movement. There is an advantage for him in that, because if you are going to give an address of welcome 92 times, by the time that you come to the twentieth you will be pretty well word perfect, and can sit back and enjoy your dinner.

" There are advantages in having innumerable conferences so far as the Mayor of the town is concerned, because he will not be in the difficulty experienced by the Mayor of a Southern town which had only a few conferences, but they happened to include one concerned with newsprint and one of the distributors of fish and chips, and at the second one he said : ' I do not know what I can say, apart from the fact that I have observed, whilst you have been here, that you are very much wrapped up in each other.' The Deputy Mayor may make the same remark, with a different significance, about the Savings Movement and ourselves.

CONSIDERATION OF NATIONAL ECONOMY " This is the fourth Conference which I have attended in Harrogate this year, but I am not going to say a word about what he will say in a moment in his words of welcome. He might, however, draw a certain parallel between ourselves and the Savings Movement, in that we have much the same objectives in mind. I have been a keen supporter of the Savings Movement for many years. The object of that movement is to inculcate a spirit of thrift in the younger generation and to have serious regard to the economy of the nation. The watchword of our Conference is the saving of material and the increased efficiency which are vital for the production of this country, and of all the conferences which the Mayor will be called on to welcome none will be more important, so far as the well-being of our country at the present time is concerned, than that of the Institution of Production Engineers, because we are intimately concerned with those vital matters which affect our national economy.

" We are delighted to have this opportunity of coming to Harrogate. I do not think that many of our members will partake

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of the waters, or at any rate of the waters in the Pump Room. They will, however, enjoy this wonderful town with its beautiful layout and the very fine air which blows over the moors. Outside this town you will find some of the most glorious moorland scenery to be found anywhere in England. If my colleagues follow my example they will come here again and again to enjoy the hospitality and the beauties of Harrogate. In asking you to honour this toast, I should like to say how grateful we are to the Mayor and Corporation of Harrogate for the wonderful reception we know that we are going to have."

Response by the Deputy Mayor of Harrogate

The Deputy Mayor of Harrogate (Alderman Whiteley), who responded, said : " Dr. Schofield has said what I was going to say about this wonderful town, but I should like to thank you for your hospitality this evening and to apologise for the absence of the Mayor. I especially regret the reason for my being here in his place to address you, in that the Mayor is seriously ill. I should like to thank Dr. Schofield for the delightful way in which he has proposed this toast and all of you for the way in which you have responded to it.

" As he says, I have had the duty of responding to this toast on many occasions in the last twelve months, and I am perturbed to find that ' a lad from Halifax ' has had the hospitality of the Harrogate Corporation no less than four times in twelve months !

" However I welcome you all here very sincerely. We have succeeded in the policy which we laid down five or six years ago of making this the No. 1 Conference town. We have depended for a century and a half on the spa treatment, but fashions change and medical science advances, and there is now no longer the same desire for that treatment, and therefore we had to find methods of getting people to come here for their holidays, to retain their health rather than regain it. We have tried to make the town even more beautiful than our predecessors laid it out to be, and we have set out to welcome conferences. We believe that we are taking our share in promoting the economy of this country by helping people to regain and retain their health, and by bringing them to a charming town with delightful surroundings, thus bringing them back to nature, which is one of the best cures for despondency and all the other ills from which we suffer in these days.

" I should like to welcome Dr. Garbett to this town. It is not the first time that I have had that pleasure, because many times he has come amongst us. We thank him for the inspiring words he always gives us.

" I should also like to welcome Mr. and Mrs. Walter. I always like to welcome people from overseas, and if possible to tell them a

story to remind them of home. Sometimes we have need of a dictionary for dealing with our friends from over the water, and there is a story of an American who after the war was looking at the bomb damage in London and came across a church which advertised that it needed £30,000 to complete its restoration. The American at once offered to find the money, and did so. When the time came for the church to be re-dedicated, he could not be present, and so a record was made of the vicar's remarks. When these were played over to him, the American was considerably annoyed, because the vicar began by saying : ' We must now give thanks in prayer for this succour from overseas.' That is what the Archbishop calls ' a carefully prepared impromptu. ' "

"The Guests"

Mr. Walter Armstrong, M.B.E., Past-President, Yorkshire Section, who proposed the toast of the Guests, said : " On the shop floor, the engineer has very little difficulty in expressing himself, but tonight the circumstances are somewhat different, and this is one of the rare occasions when I should value a classical education. I read with some dismay a few days ago that a certain archbishop, who shall be nameless, was demanding a higher standard of intellectual qualifications for the ministry. I wonder what standard of intelligence he demands from an after-dinner speaker at this stage of the proceedings !

" I have a list of guests, to which I would refer as short but wholesome. We are very gratified indeed and greatly honoured by the presence of His Grace the Archbishop of York. We welcome him here not merely as a dignitary of the Church, but as a very wise man and one who has a very practical affection for his fellow men. He never spares himself and is always willing to play his part and to give to others the benefit of his long and very valuable experience in the conduct of the affairs of this country.

" It was a very wise move on the part of the Conference Committee to invite here a high dignitary of the Church. It is only right that we as engineers should ally ourselves with the Christian Church. This is nothing new—the Leeds engineers have as honorary chaplain the Vicar of Leeds, Canon Reeve, whom we greatly respect, and the London engineers have the Dean of St. Paul's as their honorary chaplain. Halifax and Keighley I cannot answer for I do not know whether Christianity has reached those parts.

" Our thanks are due to Alderman Whiteley for taking the place at such short notice of the Mayor, who is unable to be present on account of illness. I am sure that you would like our Secretary, Mr. Woodford, to convey to the Mayor and Mayoress our sincere wishes for his speedy recovery.

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" I now come to a part of my toast where I must tread carefully, and where a classical education would have been of great value. We are very pleased to see the ladies here. Tonight they must be proud of their husbands or at all events proud of the company they keep.

" At the same time, ladies, I ask you to be on the alert. Harrogate is a very fine shopping centre. Do not be misled ; all sorts of red herrings are being dragged across the trail to keep you away from the shops. Dr. Schofield has enlarged on the beauties of the gardens. You have even been invited to attend our discussions. I repeat, do not be misled ; take the cheque-book with you, and do your best ! If I may say a word of comfort to the men, and the ladies will refrain from listening, there will be plenty of time to stop those cheques, because I do not suppose that Harrogate will part with the goods in exchange for an engineer's cheque !

" For the benefit of our friends from the South, we had arranged for a small team of interpreters in case of difficulty, but the scheme has fallen through ; we have many members who speak Yorkshire fluently, but very few speak the King's English.

FRIENDS IN AMERICA " We are delighted to have our American friends with us. It is essential that very active co-operation should be maintained between our country and the U.S.A. We are glad that they are taking an active part in this Conference, and we are sure that they will depart feeling that they have contributed much and have learnt something from us.

" We have also with us our good friend Sir Norman Kipping, the Director-General of the F.B.I. He is taking an active part in this Conference. We look on him as a champion of free industry and offer him our active support in the very good work which he is doing. We look forward to listening to him later in the Conference proceedings.

" We have with us Councillor Christelow, Chairman of the Harrogate Corporation Publicity Committee, and Mrs. Christelow. Harrogate is getting a good deal of publicity at the moment, and it is justified. It is a fine town for conferences ; the accommodation is here, the welcome is here, the site is ideal, and the air is like wine—I wish that I could say the same about the waters !

" I have dealt with the figureheads, and I now come to the people who really do the work. Mr. Baxter and Mr. Bryant have given most active support to the work put in by our regular staff, headed by Walter Woodford, our Secretary. A tremendous amount of work has been done to perfect the organisation, and I extend to the

Harrogate officials and to our permanent staff, headed by Mr. Woodford, our very best thanks for the work which they have put in.

" This toast will be responded to by Major Geoffrey Kitson, one of our Yorkshire industrialists who always comes forward to help us and who has done a great deal of work in connection with technical education. I am very pleased that he is able to be here.

WELCOME TO THE PRESS " We also have with us members of the Press. They carry a very heavy responsibility, and their task is difficult, particularly at a gathering like this, where there are no sensations. There is no lack of sensations elsewhere. I have heard it whispered that the schools of economics are going on short time because the supply of politicians is now greater than the demand.

" I would ask the Press to try to give a true report of the objects of our Conference and of what takes place. We are here to tackle a very serious and a very difficult task. I have the greatest respect for the Press, or for parts of it at any rate, and particularly for the technical Press. I came across a few words the other day in a technical journal which I think are worth repeating, because they give us the essence of the situation : ' Efficiently equipped, organised and supplied, the metal-working industries can afford to everyone the means of deliverance from want and drudgery.' That gives the lie to the statement which was made a short time ago that in an age of machines there can be no room for Christianity. That is not true.

" It is our job and our profession and our vocation—a vocation which we have chosen, a worthy vocation and one of which we intend to be worthy—to ease the burdens of life, to reduce the menial tasks, to make it possible for men and women to have a longer time to develop their talents on a higher plane. It is not altogether our task to detail how that shall be done ; that problem I will hand back to His Grace. We will provide the greater leisure, and we hope that he and his colleagues will teach people how to use that greater leisure to the best advantage.

" To all our guests—those that I have mentioned and those who have not been mentioned—I extend a very warm welcome to this gathering, and to all who have come from other parts of the country I offer a very warm welcome to Yorkshire."

Response by Major Kitson

Major Geoffrey Kitson, O.B.E., who responded, said : " When I learned that I was to have the honour of replying to this toast, I was very much encouraged to see in a newspaper a report of the

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verdict given by a jury in London at the end of a long trial, when they said : ' We find the prisoner Not Guilty ; we find that he pleaded his guilt through a misunderstanding, and we strongly recommend him to mercy.' I hope that at any rate all the guests will bear with me when I ask for the same judgment on myself.

" Mr. Armstrong has referred to most of us in such felicitous terms that I am embarrassed in trying to cover the ground. Many might be tempted to make a speech, but I always try to resist that temptation, certainly at the end of such a delightful programme as this. I feel that I occupy the same position as the Skylon at the Festival of Britain. One of our Yorkshire natives went to London and had the beauties of the Skylon explained to him by a London engineer. At the end, the Yorkshireman said : ' But surely it must do summat ? ' All I can say is that that is about all I am going to do. The Skylon has a somewhat different design from myself, but I believe that it is true to say that it began its existence in Leeds, which is one of the suburbs of Harrogate.

" What do we know of your great Institution and its members ? We know of your generous hospitality but, more than that, we know you as an integral part of British industry, and indeed of the whole British nation. Without saying any more, I offer you our most grateful thanks and our congratulations."

The proceedings then terminated.

First Plenary Session, 29th June, 1951

HOW TO FACILITATE THE INTRODUCTION OF IMPROVED METHODS INTO INDUSTRY

by W. HAMILTON WALTER,

Assistant Chief of the Economic Co-operation Administration Mission
to the United Kingdom

THE First Plenary Session of the Conference was held at the Royal Hall, Harrogate, on Friday, 29th June, commencing at 9.15 a.m. The President of the Institution, who occupied the chair, extended a welcome to everyone present and said that he was delighted to open the Conference. At the dinner the previous evening, very properly, among their American guests Mrs. Hamilton Walter had the limelight. To-day, no longer overshadowed by that delightful lady, it was Mr. Hamilton Walter on whom attention was focussed.

Mr. Walter had stepped into Mr. W. L. Batt's place at rather short notice, because Mr. Batt had been summoned to Washington for a Congressional hearing. Mr. Batt had written in most felicitous terms about Mr. Walter, and had assured the President that no American could be found in this country to-day who was more competent to put the American point of view. There could be no doubt that the Conference was extremely fortunate in being able to have an address from Mr. Walter.

MR. W. HAMILTON WALTER

It is a great pleasure for me to be here to-day to address this Conference on the central theme of your whole meeting. Among other things, I had been asked to pay particular attention to the human problems involved. After hearing His Grace the Archbishop of York last night I feel very humble, and would ask you to accept his comments in full coverage of the human aspects of productivity. I shall try, therefore, to cover the balance of the subject, which in itself is what we in the United States would call a tall order.

The question is how to facilitate the introduction of improved methods into industry. I do not know whether you really expect a visiting American in your midst to give you, in a few minutes, a solution to a problem which almost everybody here has probably spent a large part of his life trying to solve. That would be

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W. Hamilton Walter, B.Sc.

extremely flattering, but not very realistic, and I am sure that you all know better than to expect it. The framers of your programme, however, did have a point. They knew that you know the various possible ways of facilitating the introduction of improved methods into industry. You and your predecessors have been introducing such methods for a couple of centuries. They may also have felt, however, that many of you, probably by long experience, know all sorts of reasons why some of these ways will not work, and so they said to themselves "Let us get somebody who does not know all these reasons to give us the rosy possibilities, in all his bright innocence ; he may be able to give—who knows?—some suggestions which may conceivably be worth considering ; but, even if he does not, he will have provided a nice, shiny target to shoot at, in more senses than one."

**AMERICAN
METHODS OF
PRODUCTION**

From my own relatively limited experience in this country, I do not believe that it would be very wise for me to tell you what you should do to improve production methods here. It will be much more appropriate and helpful, I believe, if I concentrate on how the job is done in my own country, and let you decide for yourselves how much, if any, of all this is applicable here.

Ever since the productivity teams started to go to the U.S.A. under the auspices of the Anglo-American Council on Productivity, I have heard and read discussions here on whether there is anything that British industry can learn from American industry. It is said that the conditions in the two countries are very different ; America is a huge country with a mass market which makes mass-production possible, while Britain is one-third as large in population and depends on a varied export market where there are hardly two customers who want the same quality of calico or the same size of machine. America, it is said, has vast natural resources ; many of her raw materials are close at hand ; Britain must import most of the ingredients of her production. America has and uses an enormous volume of electric power in industry ; Britain is severely limited and sometimes actually deprived. I think that those in the northern part of this country suffer very greatly in this way. Britain, which started the Industrial Revolution, is weighted down with old and obsolete machinery and plant ; America, which started much later, is blessed with brand new equipment—and so forth and so on.

There is some truth, of course, in all this. Our two countries are different, though not quite as different as some people imagine. A very large number of American manufacturers, despite the size of the country as a whole, serve only a regional market, not very different from a similar one here. America too must import many

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of her raw materials, as many American users of tin, rubber and wool are well aware. There are British plants with the very latest equipment. By and large, however, the differences are there, and certain methods which work in the U.S.A. will not by their very nature work here.

**EXCHANGE OF
INFORMATION
IS VALUABLE**

Does this mean that there is nothing that one country can learn from the other? I, for one, do not think so. I know for a fact that there are many things which American manufacturers and engineers can learn and are glad to learn from their opposite numbers in the United Kingdom, and this despite the differences between the two countries. I feel that after all due allowances are made for these differences—and these allowances must be made—there is still a substantial residue of information and ideas and methods in American production which may be of value to industrial producers elsewhere.

I can assure you that there is no magic in American methods of production. Those of you who have had the experience of visiting American plants, as many of you have, or who have read the reports of the various productivity teams, will know that there is very little which is truly startling in the technique employed in the U.S.A. Most of the manufacturing methods used in America are well known here, and many of them are in operation in Britain. In some industries there are firms here which are as good as the best in the United States, and I have come across cases where the all-round efficiency on the job to be done is better here than in the United States equivalent.

The other day I had occasion to go over a British-managed and operated plant which is a counterpart of a similar plant in America, and I was able to make a very general comparison, because I had also seen the American factory. Although I am no expert in that particular industry, I was familiar with the general pattern of the production involved, and I feel that, on the basis of the net results of the two operations, the one here has the advantage. The British company did not use the same machines or the same layout as its American counterpart, but it did produce its product at a lower cost, and that is the acid test. What really counts in a competitive market is the cost of the finished product, because that determines the possible selling price and the profitability of the enterprise. In this case the production personnel were most resourceful; they took the best of the experience available in Britain, the United States, Canada and elsewhere and then created the machines, processes and manufacturing methods suitable to existing conditions here. I cite this case to show that I am well aware that industrial efficiency, or even high productivity, is not and need not be an exclusively American affair.

**THE
PRODUCTIVITY GAP**

There is no doubt, however, that, taking the industrial picture as a whole, there is this productivity gap between the United States and other countries. The figures show that the output per man in most individual industries, and certainly over industry generally, and agriculture as well for that matter, is greater in the U.S.A. than in many other countries.

I should like to point out at the outset that, until recently, the great mass of Americans have not consciously striven for higher productivity. We have not had national productivity drives to get each man to increase his output per hour and step up his rate of production. On the other hand, productivity in the United States did not grow like Topsy. What did happen, I believe, was something between the two. Conditions existed in America—natural, geographical and historical conditions—which made a high degree of industrial efficiency possible. Once the Industrial Revolution got into its full stride in the U.S.A., American industry, labour, and particularly the consuming public caused these favourable conditions to be maintained. What, then, has been the experience of American industry in introducing improved methods into its operation? I should like to divide my answer to this question into two parts, and in the first part I shall explain why I think that the three partners in American industry—the manager, the technician and the worker—want to introduce improved methods at all, while in the second part I should like to mention some of the ways in which each of these partners goes about facilitating their production, as your programme puts it.

Why does American industry want to introduce new methods? The answer—and I think that it is the key to the whole problem—is that each partner in American industry has a very strong personal motive for being as efficient as he can be. When people want something very badly for themselves, they usually do something about it. I do not think that the Americans differ from anybody else in this respect. I do not want to imply that a strong personal motive is the only one which will work in increasing productivity. If personal motives cannot be employed, and it is in the nation's interest, as it is now, to obtain the greatest possible volume of production, it is essential to appeal to patriotism, and in time of war we in the United States did not neglect the patriotic appeal either. The fact remains, however, that in more normal times, such as the period between the last two wars, there was a strong personal motive which induced Americans to improve their industrial efficiency at a greater rate.

COMPETITION—THE GREAT INCENTIVE

Let us take each partner in American industry and analyse what the motive is in each case. The chief inducement to American management to keep productivity at its highest peak can be summed up in one word : competition. American management does not go all out for efficiency just because it likes it ; it does so primarily because it has to do so. High turnover and good profits are, of course, valuable inducements. There are plenty of carrots to munch, but it is the stick of competition which has the biggest influence. If American management does not keep on its toes, it does not stay on its feet. It is the stick of competition which drives American management to attain the greatest possible efficiency, which in turn helps them to give the people of the United States an ever higher standard of living.

I would not claim that American business men are all 100 per cent. enthusiasts for extreme competition. Some of them are not too happy about it, but on the whole American business revels in competition and realises that it is the major force making for industrial efficiency. I am sure, however, that even if American business lost its zest for the race, and decided that it wanted to relax for a while and to work out some convenient arrangements for taking things easily, the consuming public would not let it do so. The American consumer has the last word ; he pays—or, what is more effective, he decides not to pay—the piper, and therefore he calls the tune. The piper had better play the tune he wants, or some other piper will beat him to it. This sort of thing keeps costs low, and that means that it is necessary to find every possible way to improve efficiency.

You may be interested in just one small example of how the force of competition affects our industrial thinking in such matters as the relations of engineering development to costs and price. In New York not long ago a close friend of mine, the sales manager of a leading automobile firm in Detroit, told me that representatives of the various divisions of his company spent a considerable time trying to decide whether or not a certain particular engineering improvement should be introduced into their cars. It was agreed that the added feature was excellent, but it would add slightly to the cost of the car ; the total extra charge to the consumer would be five dollars on a price of 2,000 dollars, but that was enough to decide the issue, and the answer was "No." In the current state of the competitive market, the company was not prepared to risk adding even five dollars to the sales resistance of the customer.

We are all familiar with the phrase "ruthless competition," but I do not believe that it is as popular in America as it is elsewhere. Our form of competition is, of course, ruthless to the inefficient, but it is the prevailing American notion, which is written into our

laws, that lack of competition is even more ruthless to the great mass of the population, because it gives inefficiency a protective cover which keeps living standards low. I do not think that it is too far-fetched to say that it is ruthless lack of competition in some of the continental countries, for instance, which is responsible for such a large Communist vote at the polls. Large masses of people can easily lose faith in our whole democratic system if industry is not kept on the *qui vive* to produce more goods for more people at lower cost.

The reports of our productivity teams—I should say of your productivity teams, but I sometimes think of them as ours, because we work so closely with them—have made it clear that it is the competitive spirit at every level which is responsible to a great extent for the high productivity in the U.S.A. There is no doubt that in the case of management it is the primary incentive.

OPPORTUNITY FOR THE TECHNICIAN

Turning now to the American technician, I would summarise his leading motive also in one word: opportunity. This has two aspects. One is the wide-open personal opportunity to reach the top, not only in the engineering profession but in the ranks of higher management itself. This again is not exclusively an American development, but it is a fact that a very large number of the leaders in American industry, and the presidents of big corporations and manufacturing enterprises, are individuals who entered industry at the technical level. Many of our firms are run by salesmen, lawyers, accountants and so on, but I would guess that the largest single source from which American top industrial management is recruited will be found to be people with a scientific or technical background, who started as engineers or as technically-minded workers whose zest for going in for gadgets and improvements could not be restrained. It is this prospect of self-advancement that makes American engineers constantly eager to put forth new ideas for industry.

The other aspect is the opportunity which the technician in American industry has to try out and introduce new ideas with little hindrance from either of his other partners in the industrial team. Engineers the world over are people who enter their profession because they like to make things and improve things and try things out. If they are frustrated in their natural ambition to change things by workmen who fear change, or by managers who are content with things as they are, their enthusiasm for bright ideas is bound to peter out. In America, engineers and technicians of all types have full opportunity to exercise their ingenuity and display their resourcefulness. Management is not only open to

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new ideas in the technical ranks but often on its knees begging Production Engineers to break a certain bottle-neck, or to improve on the latest brainstorm of a rival company.

In this way, the strong personal motives of both these partners in industry mesh together beautifully. The spur of competition makes management eager to give the technical man, the Production Engineer and all his colleagues, the opportunity to put his ideas into practice.

BENEFITS FOR THE WORKER We now come to the third partner. Why does American labour want to improve methods in industry? It is affected to some extent by the two motives which I have already mentioned. There are workers who want their firm to stay in business and prosper in a competitive situation, and so co-operate willingly with the improvements which are required to keep their firm competitive. There is also the opportunity of advancement for individual workers who suggest methods for improving efficiency, and who display an intelligent and constructive interest in the operation of the plant. However, the word which sums up the main interest of the workers in the improvement of industrial efficiency is the word "benefits."

The American worker has gained, and continues to gain, two major benefits from the higher productivity of industry in the United States : one is greater income, and the other is lighter work and shorter hours. The American worker gets his higher income from increased productivity from the combination of a bigger wage packet and lower prices. The American worker is well aware that the more efficient his firm is the higher will be the profit, and the more he will be able to demand and get in wages. This is not something which he has been told in a leaflet or a poster or a film, but something that he has learned from his own personal experience.

American labour has charged a high price for its services and has succeeded in getting industry to pay it. American price competition is not based on low labour costs ; on the contrary, the man who is most dramatically identified with the development of modern mass-production, Henry Ford, embarked on this policy of producing in bulk at the lowest possible price by paying the highest wages at the time to labour. The motive of the high wage paid by his own firm is coupled, in the mind of the American worker, with the relatively low price of all the commodities he has to buy as the result of the overall efficiency of industry.

This may be one clue to why so-called restrictive practices are less serious amongst workers in America than elsewhere. The other clue may be found in the fact that the American working week now averages less than 40 hours. As some of the worker

members of productivity teams have noted and reported, the average American worker has more leisure time, and more energy left at the end of his working day for making use of his leisure time, than his opposite number on this side of the ocean.

The American worker has seen with his own eyes that improved methods of material handling, better layout, more mechanisation, motion study and other policies and practices which promote industrial efficiency have all succeeded in taking the sweat and pain out of the job. He knows that they have given him a longer evening and week-end, and he knows that in the whole economy there are more jobs than ever to go round, and that pay has never been higher. Restrictive practices introduced to cope with past fears are not likely to last long in the face of such experience.

The major motives which impel American industry to ever-greater efficiency are therefore competition for management, opportunity for the technician, and benefits for the worker. This is not to imply that such motives do not exist here or anywhere else, nor that these are the only motives which can make industry more efficient ; I am merely stating that these are the chief inducements to higher productivity in the U.S.A. It is for the people of each country to decide first of all whether they really want a greater volume of goods ; secondly, how badly they want them ; thirdly, what motives they want to appeal to in getting them ; and fourthly, how to create the conditions to permit these motives to work. To answer these questions is a tall order, and I do not intend to fill it this morning ; that is up to you and your partners in the British industrial team.

IMPORTANCE OF THE PERSONAL INCENTIVE There is, however, one suggestion which I would venture to make. Regardless of whether you employ the same incentives that operate in America or manage to find workable substitutes for them, it is important to find some strong motives which will give each person in industry an intensely personal stake in higher productivity. I think that is nine-tenths of the answer to the question which is the subject of this Conference, the way to facilitate the introduction of new methods into industry. It is to supply each manager, technician and worker with a powerful personal incentive to efficiency and a strong disincentive to inefficiency. There is no real substitute for the carrot and the stick.

It is illuminating to see what is happening in places where it was imagined that the production machine could be kept going by abolishing such incentives altogether. It was originally the notion on the other side of the Iron Curtain that the State could dispense with these old-fashioned methods completely, but the people in control there soon found how wrong they were. Their economy

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would not work without strong motive forces to propel it, and so now they have gone to the other extreme. Most of the emphasis in the totalitarian States, in the form of a disincentive to inefficiency on the part of managers and engineers, takes the form of possible arrest and trial for sabotage, while for workers it takes the form of deportation to forced labour camps. The Soviet carrot is also interesting ; it is a form of incentive scheme towards Stakhanovism, and means a vicious speed-up and sweat-shop system which no free trade union in your country or mine would tolerate for a moment.

We in the free world have much better ways of doing the production job than that. In our various ways, our democratic countries can attain high industrial efficiency without resorting to the whip, the tommy-gun and the fatal knock on the door at midnight. Not only are our methods more in tune with the spirit of free people, but they also work better. So much for motives.

THE THREE PARTNERS During the rest of my talk I would mention briefly some of the ways in which the three partners in American industry help along the introduction of improved methods. Here again I should like to emphasise that none of these approaches is remarkably new or different from what you have here. There are likely, however, to be some differences in degree or emphasis, and it is for you to decide how many of these techniques are applicable here and how much stress it is appropriate to give them. Once more let me take the members of the industrial team one by one.

Starting with management, there are three points which I would mention. The first comes under the general heading of leadership. If a manager in America wants to introduce a new machine or method or arrangement in his plant, he generally considers it part of his job to lead the whole factory into the change. It would be no use for him to complain loudly that his workers refuse to accept it ; no one would listen to him, and his own colleagues would tell him that he must have failed to do an essential part of his job, which is to sell the idea to his own work force.

This is not always an easy task. Our workers are not in every case free from all resistance to change. Management, however, considers it part of its natural role to explain and demonstrate and prove its point to all its partners in the common enterprise. This is not something which management does every once in a while, when something comes along ; it is an all-the-year-round process ; we are familiar with what you call joint consultation, which is practised in many firms, and even more firms achieve the same result on a more informal basis, with management moving on and off the shop floor all day long and individual workers approaching

the front office as occasion demands. The chief of our E.C.A. Mission, Mr. W. L. Batt, a former union member and engineer who became a top industrialist, has a pet phrase for this ; he calls it " Shirt-sleeve co-operation between management and labour in the production processes."

**KEEPING LABOUR
IN THE PICTURE** We are also familiar with what you call works information. We have all sorts of fancy names for it, but it is essentially the same thing, only we go in for it on a much vaster scale. American management, especially in the larger enterprises, devotes a great deal of time and money, energy and thought, to the task of keeping the employees in the picture. We issue elaborate plant magazines, explaining the company's operations and finances in considerable detail, and try to make the employees feel themselves identified with and proud of the company.

You may wonder whether all this pays. The answer is that American business men are not in the habit of throwing their money away for no return ; they feel that the results of these employee relations programmes amply justify the large sums spent on them. The most obvious results appear when the time comes to introduce new methods into industry. When the work force is well in the picture, the background of mutual confidence and understanding already created makes the job of selling the new idea very much easier. All this is part of the leadership which management should properly exercise in industry.

**FREE EXCHANGE
OF IDEAS** The second item on the management side is the free exchange of ideas. This involves not only receptivity to new concepts and developments, but willingness to share ideas with others. It applies with equal force to the technical side, but the decision to accept or to share an idea is usually in the hands of management.

Until a few years ago, many manufacturing firms in the U.S.A. were reluctant to receive visitors from other companies and frowned on exchanges between technical personnel ; but there has been a sharp change in recent years. Complete willingness to share production know-how is not universal yet, but the tendency towards free exchange is very remarkable. It is only necessary to attend one of the many meetings of engineering societies which take place each year in New York, for instance, to see how the engineers of one company pass on the newest production information to their colleagues in other firms. If you look at one of the big trade publications in the U.S.A., you will see how proud companies are in reporting and publicising their latest innovations.

This may seem a dangerous practice, but many successful

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managements do not see it in that way ; they have every confidence that by the time their competitors get round to using the published ideas, they themselves will already be several steps ahead with a brace of new ones. By opening their doors they offer a challenge to others, and at the same time to their own Design and Production Engineers, who must keep a few jumps ahead.

The best example which I have heard recently is one noted the other day by the editor of the *Christian Science Monitor*, who reported that one of the leading makers of inexpensive jewellery in a New England city developed the only machine in America for making a certain product out of certain material. Because of the shortage of other materials, this machine became virtually a necessity if other manufacturers were to stay in business. The firm owning the machine has invited any of its competitors to come in and look it over, copy it, adapt it and do anything they like with it, and have even offered to make skilled operators available to make the machine work equally well for them. The editor of the *Monitor* commented that this firm had gained more by helping its competitors and preventing them from being ruined than it would gain by selfishly clinging to its possible monopoly.

American industry is convinced that there is a great deal to be gained by cross-fertilisation of ideas between firms, between industries and between countries. I am told that when the project for the organisation of the Anglo-American Council on Productivity was first announced, there was an outcry here from some quarters that Britain should be too proud to seek information from the upstart country across the ocean. However that may be, I can report to you that the "upstart country" is not in the least too proud to learn anything useful from anyone on this side ; in fact, it is doing so every day. Because of the varied national origins of the American people, we find it natural to pick up ideas from anywhere. We delight in taking discoveries from one place, knowing the needs in another and joining the two to make a commercial but useful product. I recall an instance where a German-American knew of an apparently useless French patent and heard of an American requirement and put the two together. He bought the French patent for a song, worked out the way to put it to practical use, created a device for which everyone was looking, and set up a profitable business to make the new product in the U.S.A. An English company then acquired in the normal way the British patent rights, and it is being used extensively here and in the Commonwealth. You probably know of many other examples of how the cross-fertilisation of ideas works to the common advantage of all concerned.

American management is now actively promoting the exchange of ideas within its own ranks. The reports of productivity teams

have noted this repeatedly, and have urged a similar attitude on industry here. The activities of the teams themselves and the whole operation of the Anglo-American Council on Productivity are good examples of this development. The technical assistance programme of the Marshall Plan, which pays the dollar expenses of these teams, is a major effort in this direction on an international scale.

**AMERICAN
ENGINEERS FOR
BRITISH INDUSTRY**

To supplement the work of these teams in Britain, you may be interested to know that the Marshall Plan is bringing over a small number of Production Engineers who are specialists in several types of manufacture. We propose to make the services of these men available to British industry to the extent that their knowledge of American production technique may have value in particular industries here, and with the great joint defence production effort which our two countries are undertaking to carry out our part of the North Atlantic Treaty defence programme, there is every reason why we should work closely together and assist each other. We have been glad to adopt some of your excellent designs for jet aircraft, and we hope that we may be allowed to reciprocate and give help to you in some of your own production problems in that area.

We have no illusions that this movement of production know-how across the Atlantic is only one way. Many of your teams have taught our people a thing or two, and the American teams which are coming this way are bound to pick up new ideas. The first American team, which came to visit the cotton industry in Lancashire this month, has already done so. Largely as a result of the team visits both ways, I have heard many industrial leaders say that there is much that the best firms here can teach less efficient firms, and that it would be useful to have productivity teams operating within the United Kingdom itself. The productivity gap is not between the best firms of our two countries but between the average ones. The major task here is to bring up the average efficiency of each industry much higher. That can be done more easily, we think, if the better firms are willing to bring their own lights out from under the bushel.

**LIAISON BETWEEN
UNIVERSITIES AND
INDUSTRY**

There is a third point on the management side which I should like to mention. American management maintains the very closest relations with institutions of higher learning. It looks to the universities to fill its ranks not only with trained technical personnel, but with trained administrators. There are large schools of business administration in many of our leading universities. The graduates

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of such schools are given the scientific approach and tend to be highly receptive to improved methods. American firms also sponsor large scientific and industrial research programmes in conjunction with universities and technical institutions.

There is a considerable shuffle of personnel between the research departments of major firms and the scientific departments of educational institutions. The result is that our universities have a healthy respect for our industrial management, and our practical men in industry meet the scientists in university laboratories, so that they get into the habit of working together. I can assure you that this close relationship between universities and industry has a great bearing on the matter of facilitating the introduction of improved methods in industry. So much for the management side.

Coming to the technical man in American industry, there is only one major subject which I want to mention. It again relates to education and training. One of the most effective ways in which American industry facilitates the introduction of improved methods is by filling its technical ranks with people whose education and training make them enthusiastic about accepting and initiating technical improvements. There are two aspects of this picture, quantity and quality. Sir Ewart Smith, who is to address you tomorrow, has made a detailed study of the number of technologists produced by American universities and technical institutes, and has made comparisons with the figures for the United Kingdom. These comparisons are striking. I will not go into statistical details, but I should like to point out that American industry has its problems too.

Let me give you an illustration of that. Before the war, three of our leading manufacturers, three companies, between them absorbed 1,500 young college graduates a year, the greater proportion of them being engineers. Last year these same companies took 3,000. They want 3,000 this year, but they will get only 1,500. This year some 8,000 companies are looking for 60,000 graduate engineers, but there are only 35,000 coming out of the schools. For the next two years the situation will be even more difficult; only 26,000 engineers will graduate and be available in 1952, and in 1953 there will be only 18,000. This falling off is apparently due to some fear, a couple of years ago, that the engineering profession was becoming overcrowded. With American industry now clamouring for engineering graduates the pendulum will swing again, and the situation should correct itself in four or five years. One fact worth noting in this discussion however, is that American industry actively seeks a large number of highly-trained technologists to maintain and improve its efficiency, and gives them positions of high responsibility where they can put their ideas to work.

AMERICAN TRAINING METHODS

As to the quality and type of training for young technological graduates, you will probably hear a good deal about the subject soon from one of the three A.A.C.P. teams which have recently been studying training methods in American industry at all levels. Let me outline a very common procedure. Technically-minded men, who may be the sons of workers as well as of managing executives, develop an early interest in production processes. When they have finished secondary school, they go to State or privately-endowed universities like the M.I.T., or to other institutes, for four or five years of balanced engineering education. As part of their curriculum they often work in industrial plants, with shop and class work alternating. The University of Cincinnati is outstanding in this respect, and no engineer graduates from that university unless he has worked in the shops for a substantial part of his educational period.

These men may start by sweeping the floor, and are gradually promoted to work with various machines. Some of them take full-time jobs in factories during the summer holidays. After graduation, there are usually jobs waiting for them in industry. There are many firms which then give their new recruits a year's intensive training, with time spent in each division of the business. Every man is considered to be a potential management executive, and in any case he must have a thorough understanding of all phases of the enterprise—finance, costs, sales, personnel and production. A future Sales Manager works for a time in the engineering department, and a Production Engineer in the sales department. After that process, it is felt that when the Production Engineer is asked to get the cost of something down by doing what he can to change the layout of the plant, he has the feeling that he is helping to sell the product and that he has a strong and essential part in the whole operation.

After this extensive education and training, each graduate is placed in an appropriate department, where he is at first no more than a glorified errand boy, and his progress depends on his aptitude and energy. He is watched during this period very carefully by management to see how he gets along. Management generally takes a tremendous interest in these young men; their aptitudes are developed and brought out so that they may be later used. Experience has shown that this method of training Production Engineers and other technical personnel brings forth competent and well-trained men, and provides industry with a young and enthusiastic working level leadership which we feel is so essential to low-cost manufacture in a competitive market.

In a month or so, about 130 of your young engineers will return from a one-year or two-year exposure to such training methods in the United States under the auspices of the Marshall Plan technical

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assistance programme. They should have their own comments to offer on the possible value of this system. I do not know the extent to which this training method is used here, or whether it is applicable to conditions in this country, but I do know that American industry considers that it is a good way to get the best modern technology integrated fully into the structure of the American production machine.

Management executives, many of whom are drawn from the engineering ranks, pay the greatest attention to the advice of their Production Engineers, and the force of competition makes it essential that technological guidance should be heeded at every turn. This method of training is therefore found to be a necessity if industry is to get the fullest value out of science and technology.

Yesterday, when I registered, I saw two Institution publications which I had not previously seen. One was entitled "Practical Training in Production Engineering," published in 1949, and the other was published in June of this year with the title, "Production Engineering as a Career." These two documents indicate the progressive trend of your thoughts, but I submit that much of importance remains to be done.

WORKERS AID What do American workers do to promote **INTRODUCTION OF** improved methods? I shall refer to two **IMPROVED METHODS** things. One is the ideas for improvements which they themselves put into suggestion boxes. You have suggestion schemes here, too, but I do not believe that they are as widespread as they are in the U.S.A., where we give substantial bonuses for ideas which are accepted. In some cases these bonuses can be quite large, because many firms pay the employees in proportion to the cost saved or the profits gained as the result of an idea. Apart from the actual value of the ideas themselves, which can be substantial, a good suggestion scheme increases the feeling of participation of the worker in the whole production process. This makes it easier to obtain worker acceptance of improvements which management and the technical people would like to introduce for the good of the firm.

The other item is the recent development, among some of the larger American trade unions, to establish production departments themselves and hire Production Engineers. The primary purpose is not to help to introduce new methods in industry, though in some instances this has happened too; the object is to be able to look after the interests of their members in dealing with management and establishing wage structures, but this in itself is a favourable factor for the introduction of new ideas growing out of work study. The practical interest of the unions in this field is a clear indication that there is no union objection to the principle, but only a proper

THE INSTITUTION OF PRODUCTION ENGINEERS

determination to get the most out of the improved efficiency for the working man and woman. Higher wages should be one of the main results of higher productivity. The training of more trade unionists in Production Engineering, regardless of the immediate purpose, can only have good effects in widening the understanding among workers of the advantages to be gained for all from technical improvements in industry.

What we have been describing this morning are some of the motives and methods employed in America to gain greater efficiency. Some of them may be feasible here; others may not. There may be ideas in this field which American industry can profitably pick up from you. Let me conclude by expressing my personal view that of the three partners in industry on both sides of the ocean it is the technical people, the Production Engineers, who are likely to be the most receptive to new ideas. They are the ones who are taught and trained to seek out and develop and activate improvements in production. They can and should play a leading role in getting the whole industrial team squarely behind the drive for higher productivity. It is upon the engineers that the whole free world depends to provide us both with the defensive strength which can prevent another war, and with the volume of production which can raise our standard of life.

VOTE OF THANKS

The PRESIDENT said that the delegates would, he was certain, confirm Mr. Batt's view that no one better than Mr. Walter could be found to open the Conference. It was not an easy matter for any speaker to hold the attention of a large audience for an hour, but he could assure Mr. Walter that everyone present had been listening to him with deep attention. That might be some reward for all the work which Mr. Walter had put into the preparation of the paper and for his kindness in coming to deliver it. He wished to convey to Mr. Walter the thanks of everyone present for coming to the Conference, and for giving a lecture which it would be an honour to have in the Transactions of the Institution.

The vote of thanks was carried by acclamation, and the Conference then adjourned, discussion groups following after a short interval, and the Second Plenary Session being held at 2.30 p.m.

Second Plenary Session, 29th June, 1951.

THE NEEDS OF INDUSTRY

by SIR NORMAN KIPPING, M.I.Prod.E.,
Director-General, F.B.I., and Joint Secretary of The Anglo-American Council on Productivity.

THE Second Plenary Session was held at the Royal Hall, Harrogate, on Friday, 29th June, at 2.30 p.m. The President of the Institution, from the chair, said that after the magnificent start of the Conference that morning and all the wisdom that had been poured forth in the Discussion Group sessions, delegates were now to have the privilege of listening to their good friend, Sir Norman Kipping, who needed no introduction to other members of the Institution.

SIR NORMAN KIPPING

It is hard to imagine such a thing, but if this meeting were being held in the South of Italy, or somewhere like that, in an agricultural community with a couple of million unemployed, we should all have to have some sympathy with the difficulty of seeing the point of higher productivity as an aim. It is pretty hard for the chap who is driving a team of oxen on a farm to see the point of bringing in a tractor to put up the speed and quantity of production, and thus lower the price of farm produce. He would be liable to reflect that he would lose his job, and that it would not be easy to pick up another round the corner. It would not be easy to realise that this new trend, taken forward until there were several tractors, would give rise to the need for establishments in the neighbourhood to keep them repaired, and that this would lead to employment and more money to spend. On what could it be spent? On more goods, but perhaps from factories in the North of Italy, not in the South.

PRODUCTIVITY AND THE STANDARD OF LIVING

It is a long and fairly remote process in that type of community to see clearly the way through from higher productivity to a higher standard of living; it is not so difficult for us. I realise that all of you here are converted, for otherwise you would not have come; but it is a fairly new thing—let us recognise the fact—for all who work in British industry to be so convinced, as I think most are aware to-day of the desirability of a policy of high productivity as

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Sir Norman Kipping, M.I.Prod.E.

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a basic condition of rising standards of living. What we are all trying to do is really no less a task than bring about a fundamental change in habits of thought.

There are all sorts of approaches to this kind of problem. I am one of those who are firmly convinced that the most unsatisfactory and least effective approach is preaching, particularly when it is done by Government. It is experience that counts, seeing for oneself. It is really with that background that the Anglo-American Council on Productivity embarked on the programme of team visits.

There are one or two features which I shall just mention, although they are well known, but you will see why I want to mention them. One is that the composition of the teams is a mixed one. It is more or less a vertical cross-section of an industry. We are all involved. If there is to be a gradual basic change of outlook in the country, a gradual recognition that higher standards of living can come only with higher productivity, it has to be realised by all, and not only by one sector. All ranks taking part in these teams recognise that fact.

The other feature is that the teams are formed by industry itself. Nobody imposes them; they are voluntarily formed, because industry thinks that it is a good thing to do, or at least that it will not do any harm. There are all sorts of shades of difference in the motives for forming teams, but the fact is that when an industry itself takes that course of action, instead of being forced to do so, the amount of interest taken in the results is vastly greater.

When I last checked up, a couple of months ago, I was interested to find that besides these reports having been distributed to the industries directly concerned with the teams, there had been a sale at that time of around 350,000 copies. I expect that has now been increased, and I shall not be surprised if the final result is that the sales are more than double that figure.

**CHANGE IN HABITS
OF THOUGHT**

Moreover, the visits of these teams have resulted in a very great deal of discussion in industry between groups of all sorts and kinds. I believe that there is a widely-spreading ripple on the waters, and that in fact we stand a chance—this being not the only means of bringing it about, but one of the means of finding that within a period of time—it may be ten years or it may be twenty years—the habits of thought about productivity, the long-term background of a hundred years or so, may undergo a fundamental change. We are dealing with a long-term objective. When I say that, I am not putting it forward as an excuse, or as a reason why we should not get on with the job with all possible speed, but just

expressing the view that there is something on the move here, in which we are all taking part, which is liable to have deep, fundamental effects on this country, and in particular on all of us who work in industry.

When I say that this is not an excuse for taking things easy I have in mind, of course, the fact that at this precise moment of time we all find ourselves in circumstances which are peculiarly difficult, and which could easily be held out to be a reason for alleging that the timing is bad. Look at the position of the industries that depend on zinc or brass, for example. At this very moment the report of the brass founders is ready for publication, and it will be out in a fortnight. It would be easy for that industry to say "This is a fine time to talk about higher productivity ; we have no zinc and we cannot get on at all. What is the good of it ?" When we realise, however, that we are really dealing here with something fundamental and of a much longer term than just the situation of the moment, I dare say we shall realise that if there is a temporary difficulty or a temporary shortage hampering the situation, that is no reason to be put off something which in the longer term is still basic.

**THE
REARMAMENT
PROGRAMME**

I should like to talk for a moment about the framework in which we are in fact operating. We have a heavy rearmament programme. It is reckoned that it represents, or will represent at its peak, about 25 per cent of the activity of the engineering industry, and perhaps 8 to 10 per cent., by and large, in other industry. To get the perspective right, I would remind you that in 1943 or 1944 it was reckoned that 80 per cent. of the engineering industry was devoted to the manufacture of armaments, so that it will be perhaps a little more than a quarter of the scale then. That means, of course, that there are going to be large numbers of engineering firms which will remain unaffected. The firms who specialise must naturally bear the main brunt—aircraft firms must make aircraft, and so on.

Between 1938 and 1942 or 1943, we brought about an increase of production in this country of about 43 per cent. We have at least maintained that increase ever since. How was that done ? Largely by bringing into employment in industry some 4,000,000 more people than were there in 1938, many from the ranks of the unemployed, many by extending the employment of women, by part-time working and all the other steps which most of us will remember.

We cannot repeat that increase now, because by and large those people are still in industry. There is no unemployment.

HARROGATE CONFERENCE

**MEETING THE
DEMAND**

That was one of the four ways in which the resources required for war purposes were obtained, and it was the most important way—by increasing production by 43 per cent. What were the other ways? We cut our exports very heavily, and we obtained credit from foreign countries that were prepared to give it to us to the tune of something like 18 per cent. We also emptied the pipe-line, and ran down capital stocks in particular. Maintenance in factories, in public works, on the railways and so on was not kept up. That is said to account for about 25 per cent. of the total.

But if now there are no reserves of manpower, and if the piling up of overseas debt is less practicable in cold war conditions than it was in hot war conditions, as I think that it inevitably must be, and if we are all going to resist going back again to deferred maintenance and running down the capital stocks of industry in the country, how then are we going to handle the situation?

Quite the most painless method will be by getting higher productivity. The only alternative—and I dare say that in part it is bound to be an alternative anyhow—is reduced consumption on the home market. That was the fourth method applied in the last war, and it accounted for the remaining 11 per cent. of the total.

That is where we find ourselves. We are going to rearm, and we are all convinced that it is the right policy. The pressure that puts on us in the short term, in terms of higher productivity, is a very obvious one.

**THE RAW MATERIALS
SITUATION**

The next point that strikes us is, how are we to tackle the task in the face of the raw materials situation? Let me start with coal, because it is just as fundamental now as it always was, and it always will be in this country. Let me say at once that there is very little that we British can say in justification of our performance in getting coal. It is the most vexatious and worrying and deep-seated of all our problems. We have got into the rut of thinking that we can just scrape by year after year with 200,000,000 tons of coal, and a little more from the open-cast mines if the weather is kind and until they run out. We lose sight of the fact that the growth of productivity, the growth of mechanisation, itself adds every year to the demand and essential need for coal.

This year, we are told, and I believe it to be true, we are going to add 1,000 megawatts to the capacity of the power stations. Heaven knows that we need it, but we are apt to lose sight of the amount of coal that will take. In July, we are going to open

the new steelworks at Margam, which in due course means another million tons of coal ; and so, wherever we look, everything comes back to this absolutely essential need.

Last year, we had to slash our export of coal and we cut out a miserable three-quarters of a million tons which we had promised to sell to Sweden. We cannot blame the Swedes if they say : " We have to have coal to preserve our industry and keep our wheels turning. We should like to take it from you but, if we cannot get it from you, we shall have to get it somewhere else." And so they go to Poland. Poland has terms on which she will supply her coal—not only a very high price, but also she requires the Swedish iron ore, high grade iron ore that takes less coal to refine it than more other grades, and iron ore that previously was coming here. We lost that iron ore because we did not have 750,000 tons of coal, and steel output suffers.

Coal is basic to the problem of higher productivity and more output throughout British industry.

Those are just a few little instances of what coal shortage does to us. It is not quite a Production Engineer's problem, but to me it means one thing very clearly, and that is that we must put coal and fuel economy at the top of the list of things industry must tackle. It is only common sense for us to put this in the forefront of our minds and work at it all the time.

**THE
POWER
SHORTAGE**

It is logical now to turn to the question of electric power. I am afraid that the power shortage will be with us for years to come. It is not because there has been an unreasonably small programme of building power stations, but because demand has gone up and up so steeply since the war, largely from industry. Why should it not do so ? We all know the figures of horse-power per worker, and that mechanisation means more demand for power. The increase in demand for electricity has overtaken the growth of the installed power supplies, and to increase the latter still further—quite apart from the question of coal supplies for them—raises very difficult questions of the right balance of capital development as between the mines, the power stations, industry, and all the other things we want to do. I fear, therefore, that we shall have this problem with us for some time, and it should mean to us in industry not only that every economy should be exercised but also that every opportunity should be seized of taking load away from the peak hours and into the valleys. That last recommendation is very easy to make, but in industry not so easy to follow ; but I am not convinced that something could not be done outside industry.

Going to the other side of the raw material problem, the shortages are not something which has suddenly turned up unexpectedly.

HARROGATE CONFERENCE

For some months—from memory I think since 1948—the stocks of raw materials held in this country have been steadily falling. That applies to a long list—coal, of course, and also iron ore, steel scrap, zinc, copper, leather, industrial alcohol, pulp. Over a long list of materials there has been a steady fall in national stocks. More recently, the Government have banked heavily on making cuts in imports to assist in closing the dollar gap, and they have succeeded.

We must not delude ourselves into thinking that the closing of that gap was done only by increases in exports from here, because only a small part of it was closed in that way; the bulk of it was done by not importing, by running down stocks. But apart from that action—which, looking back on it now, one can criticise—there was a general belief, shared equally by industry and Government, that prices were too high and would have to come down, and there was a general holding off from buying raw materials from abroad.

REASONS FOR SHORTAGES It is, in my judgement, too superficial a view to put the whole or even the main blame for the present raw materials situation on United States stockpiling. Why is it that, five long years after the war, primary products are not available in step with the demand for them? I believe that there have been great structural changes. The world population has gone up by 200,000,000 since 1939. There has been expanded industrialisation all over the world. Policies of full employment have been adopted in many countries, putting up consumption. Above all, in ten years United States production has doubled. The consequence of all these trends on the demand for raw materials has not really been realised.

At the same time, we have had in the last five years the lowest record of expansion of primary production of any similar period in the last hundred years. I believe, therefore, that there have been great structural changes in the relation between supply and demand for raw materials, and therefore that this situation is not a short-term one; I think that it is with us for a period. Of course, the pressures will be great, and the very great activities just now in building new sulphur plants are a case in point. But there is something rather deep in the causes of the situation and some of the effects may be with us for some years.

The Washington talks are a logical way of tackling the question. They constitute an attempt to find ways of sharing out on a voluntary and equitable basis the greatest available quantities of materials. To the Production Engineer, this situation should point to the need for constant efforts in the direction of conservation, substitution, recovery of scrap and so on, and I am very glad that this subject has been particularly picked out for attention at this Conference.

THE FINANCIAL BACKGROUND

One other thing which I would mention from the point of view of the framework in which we are operating is the financial framework, because there are two features of it which to my mind remain of great importance, and which are perhaps more capable of adjustment—I think much more—than some of the others.

The first is the loss of incentives at all levels, and the second is the continued policy of taxing profits to the extent of killing the only goose capable of laying any golden eggs in this country, namely, industry. Without the profits from which plant can be maintained and replaced, that goose will soon be incapable of laying.

The teams have shown, I think, that high productivity has three main ingredients. They are all intermingled and cannot be separated from one another. High productivity is concerned with attitude, with organisation, and with techniques. It is perhaps worth reflecting what are the characteristics of a really first-rate high productivity plant. That thought conjures up first of all the mental picture of a plant which is specialised. It certainly does not attempt to carry on parallel activities of manifold kinds. It is, of course, organised on the basis of flow methods, and the flow concept in the running of factories is certainly carried through in more than the mechanical sense in this plant. I do not refer only to conveyors, but to the whole of the production control surrounding it which is matched up with the flow concept, the flow basis of organisation of the plant. Phasing, timing, is vital to it, and naturally it is liberally equipped at all reasonable points with devices for labour saving. In this perfect plant, everything would have been done that reasonably could be done to ensure the best conditions at the actual point of operation. Everybody in the background is seeing that the actual operator is not trammelled or hampered by anything at all, just as an army has all its organisation at the rear, and on the supply lines, arranged to ensure that the actual fighting soldier is constantly and properly supplied, and has the best possible facilities in the circumstances.

IMPORTANCE OF TIMING Leaving out such questions as staff relationships, a "happy ship" and so on—though of course by passing them by I do not infer that they have any less importance than the others—and concentrating for the moment on the factory in its more physical shape, I should like to suggest that there are one or two features of that kind of factory that one finds in this country less often than others. In particular, I do not think that we are as conscious of timing and phasing and delivery promptitude as the ideal high productivity factory would be. I realise that there may be many men here whose plants are small and for whom

high specialisation and flow methods are inapplicable ; they may not fit a plant of 50 or 100 men. To such men I say that their contribution to high productivity takes a different form. They are probably suppliers of plant, tools and components to other people, and their contribution to the question of timing may be vital, and even more important than that of others.

I have seen one or two plants which literally do not carry cushion stocks, because so close a relationship has been set up with the suppliers both of semi-fabricated materials, and of partly-fabricated or wholly-fabricated components, that it is possible to run the plant by taking the supplies straight off the receiving bay. That is going to an extreme ; it may be practicable for Henry Ford, but it is hardly likely to be so for many plants. My point remains, however, that I believe that in this country we have given too little attention to delivery times and to the consequences of failure in delivery and of delay. Is there anything that is more damaging to a factory and that leads to greater inefficiency than just plain hold-up ? The cost of it is tremendous. I feel that this is a side of British industrial life which deserves a great deal of attention and improvement.

I have suggested that this ideal factory which I have postulated would probably be specialised. It is common today to hear a British industrialist or Production Engineer saying : " We used to buy this or that, but now we make it for ourselves," and there is a tendency for a great many firms to prefer to make things for themselves rather than buy them outside. I suppose that comes from the bitter experience of an outside supplier having let them down on delivery, or not being technically adequate for the work, or something of that kind. I believe, however, that it is often the wrong solution to manufacture in the main works. It is going against specialisation. If the reverse attitude is adopted, and the main contractor goes out to help develop a specialist who can get down to the making of that component as virtually his only job then, if American experience means anything, in the end you will get it more cheaply and with more satisfaction.

SIMPLIFICATION AND SPECIALISATION

This question of simplifying and specialising goes very deep. I think that as a country, probably because of our export markets and the varied demands to which they give rise, we have gone far too little into the question of simplification, and I very much doubt whether we know sufficiently accurately what costs are involved in retaining variety of product.

The salesman has perhaps too much say in what is made in the works, and the production man too little. The attitude of the salesman may be : " Well, that is what I can sell ; the customer is

always right, and you must make it," but when the article is put into the line and does not fit, and requires a great deal of special attention and special components, and variations have to be made for it, I wonder whether our cost accountants are able to find out just what it costs. May it not be that often our salesman is selling something for us at a loss by adopting that policy?

I do not suggest that the firm should necessarily refuse to make the special article, but he should work on a policy of encouraging much more positively, by price differences, more orders for standard lines and fewer orders for special lines.

I do not want to omit to mention the point that plant utilisation is a matter which demands extra care. It is common knowledge that some of the new armament products which are having to be toolled up now, some involving new factories, are causing a heavy drain on machine tools, and for a couple of years we are going to have a certain amount of difficulty in getting machine tools just as ordered. I am trying not to give anything away when I suggest to you that one direction in which the circumstances will justify particular attention in the near future is that of ensuring that plant utilisation is as good as it can be.

INTER-PLANT VISITS I shall devote my remaining few minutes to giving you a personal view on the question of exchange of visits between plants. I am certainly one of those who think that you have nothing to lose by it, and everything to gain.

So far as concerns any question of giving away technical details which must be regarded as secret, there is no real difficulty. Nobody suggests that when these exchanges take place a firm should give away what it is going to do next year, or something which it rightly regards as secret or a new development. That is not the point at all. It is a question of the rubbing of minds together on these visits, of seeing the other man's approach to the job, and his layout, and some of his bright ideas. My experience has been that if I do not get as much as I give on these occasions, I am being very slow. I believe that is the right approach.

It is not only through the Institution that interchange of ideas should be developed, but also through the trade associations, because there you have the facility for getting together groups concerned with the same product. I urge that more and more of the trade associations should develop it. Many, of course, have done so. Many of the teams have made visits round this country before going across the Atlantic, sometimes opening up in this way an interchange which has never before existed in the industry concerned. There is room for a great deal more development of that kind.

HARROGATE CONFERENCE

**IMPLEMENTATION
OF RESULTS**

On the question of implementing the results of work of the teams—which is one of the sub-themes of this Conference—the experience has been that the methods used by the industries which have been sending out teams are all quite different, suited to their own circumstances. In many cases the arrangement has been that all the recommendations of a particular kind, referring to particular new items of plant or new techniques, have been divided up, very often through the trade association and sometimes through the research association, and each item has been given out to a particular firm for further trial. Then the industry has met again in six months or a year to cross-fertilise and exchange experiences on the various ideas each has been developing. It is usually impossible to prove that any particular development is traceable definitely to one particular report, any more than a research association can say that a firm would not have done a certain thing but for certain research results. These things just add up. More and more influences are added to tendencies which are already in existence, and are just additional stimuli.

I come back to my starting point. All of us here at this Conference, and all the thousand people who, by next spring, will have been out with these teams, are playing a part in developments of fundamental importance to British industry, and in a revolution of thought which I believe to be of great importance to the prosperity of all of us. So stick to it !

THE INSTITUTION OF PRODUCTION ENGINEERS



Lincoln Evans, C.B.E.

THE MANPOWER PROBLEM

by LINCOLN EVANS, Esq., C.B.E.,

General Secretary, Iron and Steel Trades Confederation, and
Joint Chairman of the Anglo-American Council on Productivity.

THE President recalled that at the Conference Dinner he had referred to his own experience of the great trade union leaders in this country and had said, in Mr. Lincoln Evans' absence, how happy they were that they were going to see one of them at the Conference. He would now ask Mr. Lincoln Evans to speak.

MR. LINCOLN EVANS

When introducing Sir Norman Kipping, the President said that he was no stranger to you and that he was a member of the Institution of Production Engineers. I cannot, of course, claim that privilege, and as a trade union official I do not know whether I am a sheep amongst the goats or a goat amongst the sheep. Be that as it may, I hope that I shall not feel too uncomfortable in this very august assembly. My presence this afternoon—and I am here in my capacity as one of the Joint Chairmen of the Anglo-American Council on Productivity, and as representing the trade union side on that body—is, I think, an indication of the increasing interest that the trade union movement is taking in this matter of higher productivity.

THE "NATIONAL CAKE"

Why are the trade unions in this at all? I think their interest arises from the growing conviction that there is a limit to the extent to which we can divide our national cake in such a way as to lead to any marked improvement in our standards of life. All the signs now, to any one who can read them, are that the re-slicing process which has taken place over the last fifty years or so as a result of trade union pressure for improved standards, and as the result of the volume of social legislation which we have built up through the operation of an enlightened public conscience, has reached the limit of what it can accomplish, and, if there is to be any marked improvement in the standard of life of one section of the community, it can only be at the expense of another section unless we can increase the size of the cake. At our existing levels of productivity, there is not much more we can do in the way of an improved standard of living for the people of this country.

This concern with higher productivity and its fundamental purpose represents a change in trade union thinking from what it has been in the past. As you know, the reaction of the average

man in the workshop to appeals for higher productivity has usually two instinctive forms. First of all, he says, " You ask me to produce more, but if I produce more I am only making more profits for the boss, and any appeal that the boss makes for more productivity is simply for his own interest." The second and more important reaction is when he says, " After all, the more I produce the quicker I work myself out of a job."

This is to some extent understandable, of course, because the workman, like everybody else, if he thinks that anything is going to interfere with keeping him in his job or is going to operate against his interest, however short-sighted he may be in his view of what his interest is, is going to take any steps which he thinks will be effective in preventing that state of affairs coming about.

THE RIGHT ATTITUDE OF MIND Sir Norman's point about the attitude of mind in relation to productivity is basic, because productivity is not simply a question of improving our technical processes. We can have the best technical processes in the world, but, unless the right attitude of mind is there which will enable us to get the maximum results, we will not have achieved our object.

When we are trying to get our people to adopt a new attitude of mind, we have to be clear about what high productivity is for. What is its purpose? What is it seeking to achieve? Who are going to be the beneficiaries?

This conservatism, this clinging to old attitudes, this tendency to live always in the past, is not confined to workpeople. Management have a fair dose of that piece of original sin. Even where you have alert and progressive managements, who are fully alive to the need to keep abreast of all technical change, they often find themselves in difficulties because they forget one fundamental factor: they forget to take the trouble to inform the workmen of what is happening before changes take place. Very often when a new process is adopted, when a change is made in operations or when new machinery is introduced, the first thing that the workman knows about it is when he sees it being installed. Suspicion is at once created, and then it is difficult to get the workpeople to listen to the reasons for the change.

KEEPING THE WORKER INFORMED I have spent the greater part of my life in the workshop; I was forty-two years old before I left it and I think that I know the average British workman fairly well. I know something about his reactions and the pattern of his behaviour in a given set of circumstances. You will find, as no doubt you have found, that the average British workman is a very sensible fellow, and when the purpose of any change is explained to him beforehand, he is usually prepared to accept it

as inevitable, knowing in his heart that he cannot stand in the way of progress, however it may affect him personally. It would save a great deal of bother, however, if he were told at an earlier stage what it is all about and what his future prospects of employment are, if the change involves his displacement, as very often it does.

There is a great deal of need for more consultation. I do not mean consultation of the formal kind, which is conducted through written constitutions, and about which professors at our universities are now concocting syllabuses. I mean the kind of informal consultation in the workshop, where the foreman and the manager and the operator are continually exchanging ideas and points of view, exchanging prejudices, if you like, because we all have them.

For instance, often after a piece of machinery is installed in the shop, when the fitters have done their job and the Production Engineers are looking at it, it is found that there is something wrong with it. The man on the floor could probably see what was wrong before the machine started up. If there was some consultation between the planning people and the operating people about what is going on and the purpose which the machine is to serve, mistakes of that kind might be avoided. You do not want to do this sort of thing through a joint production committee or by means of elaborate consultative machinery, but by having good relations with the man on the workshop floor to enable you to discuss it with him. In some American factories which I have visited a great point was made of the liaison between the planning and operating staffs, and that is the kind of thing which does a great deal to remove a hostile frame of mind and an instinctive resistance to any change.

OUR THREE GREAT ASSETS We in this country start off with three great assets. First of all, I think that our people are as hard-working as those of any country ; secondly, our sense of craftsmanship is as high as, if not higher than, any in the world ; thirdly, the inventive genius of our people is unsurpassed. It may be immodest to say that in the presence of our American friends, but I think that the great inventions which have sprung from this island amply prove it. Our only fault is that we may be slow in exploiting these discoveries and leave it to other countries to develop them.

Some of these qualities are the fruit of long development. I was in Russia in 1945 for about two months, and I got certain impressions there. One cannot hope to do more, after so short a time in so large a country, than get impressions. I visited many steelworks and factories, and the first thing that struck me was the complete absence of a sense of maintenance. It occurred to me then that it is only people with an industrial history behind them who can use efficiently the tools of a modern industrial system. I give this to

you only as my impression, for what it is worth, but I think that if the Russians get the finest machines in the world, and multiply many times the amount of capital equipment in their country, they will not get the same results as a nation with a hundred to two hundred years of technical and practical experience behind it. We all know it is necessary to get the "feel" of things, and that is a matter of growth, one generation passing on to another the lessons which it has learned.

When the Anglo-American Council on Productivity was first mooted, you all know who were the co-fathers of it; they were those two very great men, Sir Stafford Cripps and Mr. Paul Hoffman. The T.U.C. responded without hesitation, believing that here was something which could make an effective contribution not only to our industrial productivity but also to something which is of prime importance for the peace of the world, a better understanding between the ordinary people of America and Britain. The T.U.C. side, like that of the employers' side, have been seized with the tremendous importance of that valuable by-product of the Council's work.

As indeed has been emphasised many times, the sending of the teams to America is not a one-way affair, with all the flow in one direction, one side doing all the teaching and the other all the learning. Our American friends were the first to recognise and admit that. It was on that basis that the Council started off. The Americans knew that, with our long and rich industrial history, we should not be simply at the learning end of an enterprise of this kind. American teams have already come over here. I could not be at your dinner last night because I was meeting the American pressed steel team which arrived at Southampton yesterday. Other teams are coming over, and we hope that the reverse flow will increase as the months go by.

**SPREADING
THE
INFORMATION**

The value of this exchange of information, however, will obviously be destroyed unless the lessons which have been learned and the experience gained are properly disseminated throughout the industry from which the team is drawn, and indeed translated into action on the floor of the workshop. This, however, has to be organised; it cannot be left merely to the team and to their subsequent report. It is not sufficient for a team to go across the Atlantic for a month or six weeks and then conscientiously and laboriously compile a report (and everybody admits that the reports which have been drawn up are first class). An effort is required by all those who recognise the importance of productivity in order to get something done.

HARROGATE CONFERENCE

In disseminating the information and experience gained, we must get people interested and get them to see clearly, without any blurred outlines, the basic purpose of this whole campaign.

How much has already been done in this country? I think that the cotton trade has provided an excellent example of how these visits should be followed up. In comparing American practice, results and methods with our own, we know, of course, that we labour under certain handicaps from which they are more or less free, and the removal of which is a long-term job. This has been referred to already by Sir Norman. For instance, there is not anything like the same amount of electrical energy behind the elbow of the British workman as there is behind the elbow of his American counterpart. This is a serious matter, and one of the basic difficulties in our industrial life, and we have to overcome it; but instead of being narrowed, the gap between electrical supply and consumption is widening. In my view, everything possible should be done to reverse this situation. Unless those who decide our capital programmes put a higher priority on generating plant there can be only one consequence, and that is the slowing down of industrial expansion. I can see no other result, and it will mean a slowing down during a period when our whole future rests on increasing output. I think that there ought to be three priorities in this country: rearmament, exports, and the provision of generating plant. It is more or less pointless to talk about continually expanding our industrial capacity, and of course our productivity, if the basic means to do this are not going to be available in ample quantity.

**USING RESOURCES
TO THE FULL**

In spite of this overriding limitation—indeed, it throws a greater obligation on us—we have to do our utmost to utilise more fully our existing resources of manpower and plant. Some of my colleagues in the steel industry are here, and are familiar with an example of the way in which it is possible to utilise existing capacity more fully. In the steel trade, ever since I can remember, we always used to close down the melting furnaces at 1 o'clock on Saturday and start up again at 2 o'clock on Sunday, and in the interval they were just kept warm. Some of us in 1945 began to wonder whether we could not close this 25-hour gap and operate the furnaces right through. Long discussions took place between the employers and ourselves. The will was there to do it, and the knowledge that something could be achieved was there too, with the result that we ultimately came to an agreement by which those furnaces should operate continuously. It is true that it did demand a small increase in manpower, but the result was not only to add the 25 hours' additional tonnage but, if we had installed capital equipment to give an equal

tonnage, it would have cost the nation between £25,000,000 and £30,000,000, and that money was saved. This meant a utilisation of resources which not only saved capital expenditure which could be used in other directions, but meant a better utilisation of the capital equipment which we already possessed.

I know that this cannot be done in every industry, but there are still, I believe, too many cases where plant and labour are not being used to the fullest possible extent. I hope that nobody will tell me that trade union agreements prevent you doing this. Trade union agreements are not like the Laws of Moses, that once on the tablets they stand for ever ; they can be altered by the exercise of goodwill and intelligence on both sides—and I emphasise on both sides. Sometimes it is difficult to do this ; it all depends on the nature of the agreement and the part which it plays in the wages structure of the industry ; but, because there are difficulties, they should not be taken as an excuse for doing nothing at all. Nor should management, because they are told "No" at the first approach, say "We have done our best, and nothing more can be done." I should not regard that as satisfactory. After all, union leaders, like the men that they represent, are fairly reasonable, and agreements can be changed, given the patience to go through the detailed process of doing it, and where there is confidence and goodwill on both sides, and where there is no suggestion that anyone is trying to "pull a fast one." There is nothing that more bedevils industrial negotiations than the feeling that there is a Smart Alec about somewhere. To the Smart Alecs—in case there are any here—I would say "You may be smart once, but you will never be smart twice with the same set of people, so that you have a short life at best, and it is not worth starting off on that road."

DEFATING CONSERVATISM

I have mentioned before that managements are sometimes as conservative as the men, and sometimes they may have to be urged forward by the men. When I was a young shop steward I was working on a plant which suffered terribly from roll breakages, because shifts were finishing early, having driven the rolls to the bone and exhausted themselves. I suggested to the management that instead of a policy of unrestricted output, every team of men being out to do what they possibly could within their eight hours, and not bothering about the condition in which they left the mill, it would be better to devise some scheme by which the output could be regulated. It took a very long time to make clear the distinction between restriction and regulation. I was satisfied that the policy of unrestricted output, over a long period, with the ups and downs of output and all the breakages, meant a total output lower than would have been the case with a regulated system of work. Fortun-

ately we had a good and sensible manager, who could see a point when it was emphasised hard enough, and who had no exaggerated ideas about managerial functions, and events proved that I was right.

Sometimes I think that this pathological—that is the only word to describe it—insistence on managerial functions constitutes as serious a restrictive practice as any of which we know. Those who do the planning for industry often forget that the most important element in everything that we have to do is the worker through which all the plans must operate.

THE RIGHT APPROACH TO LABOUR There are two extremes in this. There is the management who think that the worker does not count until it is necessary to deal with his reactions, when he becomes troublesome, and that up to that point he can be ignored. There is also the management who believe that the worker must be cajoled and bribed and generally "fuss-potted." The decent, sensible workman wants neither. He does not want to be an item in the cost sheet, nor treated as a child which needs humouring. He wants to be treated as a man, with all that that implies. He wants respect and a recognition that he and his colleagues have as great a stake in industry as the management. After all, there is a basic sanity in the British workman that, in my long experience of mixing with men, sometimes in difficult circumstances, is rarely appealed to in vain. It is largely a question of approach, and it is the job of management to know the right approach. It is not always easy to acquire it. Some people are probably born with it, but most of us are not. It has to be learned, like other arts ; there has to be a certain amount of training for it.

We know that the circumstances of today are difficult. With the calls on the nation's capital resources for rearmament and for exports, I think that we shall be forced in the coming years to depend more on the capital equipment which we have than on any marked additions to it. We are not, however, entirely helpless, because over the last five or six years we have as a country been devoting about one-fifth of our national income to capital investment of one kind and another, and to plough back one-fifth is a considerable achievement, and means that our industries should not be in bad shape. Nevertheless, there remains the need for us to use fully what we have, and that is where you as Production Engineers, probably more than anybody else, come into the picture.

The T.U.C. have been telling our people for some years now—and it is one of the most important educational jobs that we have undertaken in the T.U.C. at any time—that the practices and habits of thought and behaviour which may have had some meaning in times of unemployment and insecurity can have no relevance today,

and that unless we mentally adapt ourselves to present-day conditions, we may perhaps unconsciously reject or discard the only means by which we can look forward with any hope of our living standards being progressively raised.

We have set up a production department in the T.U.C. We have offered scholarships to the unions on production methods, time and motion study, and on similar questions which were once regarded as coming within the managerial preserve. We hold conferences with executives of the unions and federations of unions in particular industries. With all the means at our disposal and with all our resources we are trying to educate our people in this fundamental task and get them to grasp the importance of productivity in the world today. It always was important, but its significance is emerging more clearly now.

EDUCATIONAL WORK OF THE T.U.C. The trade union movement has always stood for an increasing standard of life for its people, but it cannot carry that much further by taking up the negative attitude that the field of its activities is simply wages and conditions. It has to be wider than that, and we have to regard questions of productivity as of as much importance as questions of wages and conditions. That is our educational job, and, like all educational jobs, it is not always an easy one ; but we are seeing results today which encourage all of us to go ahead with it.

Management also must do their part, because our people do not go round the plant with their eyes shut. They may not tell the foreman this, or the management that, but you ought to hear what they tell the union officials and the branch secretary about the deficiencies of the plant, and very naturally, of course, they always say that it is the other fellow's fault. They are not peculiar in that ! We know that there are thousands of hours wasted in many plants by bad organisation and layout. I have very often seen skilled men having to waste their skill, and indeed their employers' money as well, in doing a great deal of unnecessary fetching and carrying which could be done by unskilled labour, and which could be avoided with proper and intelligent organisation and plant layout.

The unions are not opposed to time and motion studies, as many people imagine that they are. This, indeed, is one of the subjects in which the T.U.C. are trying to specialise, and in which they are trying to interest their organisations. Here again there has always been a tendency to jump to conclusions. Many people think that time and motion study is simply a matter of timing operations with a stopwatch in hand. We have to get our people to understand what this time and motion study really means. We tell them that it means trying to find out the best way to do a job, and the best

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way is usually the easiest way ; but directly you mention time and motion study, it is the idea of the stopwatch which comes into the men's minds.

Unfortunately, when these methods were introduced on any scale into this country some years ago, they were always approached from the point of view of how to do a job for less money. The ultimate objective was a lower cost, but it was always put in the form of how an operation could be speeded up, output increased, and the rate reduced. For many years the average man in the shop believed that the only purpose of time and motion study was to cut his rates and prevent him earning high wages. We have to dispel that idea, and in this, like most things, an ounce of practice is worth a ton of precept.

LOW WAGES AND HIGH COSTS There are employers, of course, who are afraid of high wages. They think that, if a man earns £10, £15 or £20, that is a lot of money for a worker, and there is a kind of instinctive reaction that if a man is getting very high wages something must be done about it. They say "He is better off than a bank manager or a school teacher, and something ought to be done about it." That kind of thing leaves me cold, because low wages and high costs are usually found together. I firmly believe that if your costs are right, wages can look after themselves. On the other hand, high wages are never a handicap if costs are right. In certain industries, if there had been greater pressure by the workers for better wage standards, I am not sure that we wouldn't have rendered the industry and the nation a greater service, in that it would have compelled employers to seek and adopt better techniques and improved methods.

When it is shown and proved to our people in the workshop that higher productivity is the way towards a better chance in life for a man's wife and family, and means a bit more in his pocket for himself, I think you will get that changed attitude to productivity which is so essential. We have to relate what is done to an improvement in the man's own personal position. We have to make it clear to him that if he makes high productivity his aim, it will be related very closely to his personal position. We must let him see that he will share in the advantage which results. Unless he is given a personal interest and an incentive towards high productivity we shall never get the response that we need. My own effort in this campaign for high productivity, and the effort of the T.U.C., is due to the fact that we recognise that the only way to serve the interests not only of the members of trade unions, but of everybody in this nation, is to try to make our people familiar with this concept, that the higher the level of productivity of any nation, the higher the standard of life its people can enjoy.

VOTE OF THANKS

The PRESIDENT remarked that there could be very few Institutions that in one day could hear three addresses of the level of those to which they had listened. There had been put to them, as members of this Institution which was devoted to increasing the ability of every man to produce more, a higher target to have regard to in doing their jobs. Although Mr. Lincoln Evans did not hear Mr. Walter speak in the morning session, many of the audience must have been struck, as was the President, by some of the exact similarities between the two addresses—the shirt-sleeve consultation on the floor of the shop, and so on, were almost exactly duplicated in the two addresses, without one speaker having heard the other. Surely the views of two men who had come to these conclusions quite independently on the basis of their own experience, in two different countries, could not be wrong.

All through these three speeches the technical factors had receded into the background and the human factors had been in the forefront. It must be clear to all who acted as Production Engineers that the relationship between what they do and the men who have to carry out what they plan, is of even greater importance than all the thought being put into the planning of new works.

He asked that both these gentlemen should receive the very warmest thanks for the time which they must have spent in preparing their addresses, for the way in which they had given them, and for spending the afternoon with the delegates, for their great pleasure and profit.

The vote of thanks was carried by acclamation, and the Conference adjourned until 9.15 a.m. the following day, but the remainder of Friday was occupied by Discussion Group Sessions.

Final Plenary Session, 30th June, 1951.

THE FUNCTION AND METHODS OF MANAGEMENT IN ACHIEVING HIGHER PRODUCTIVITY

by SIR EWART SMITH,
Technical Director, Imperial Chemical Industries, Ltd.

THE Final Plenary Session of the Conference was held at the Royal Hall, Harrogate, on Saturday, 30th June, at 11.30 a.m. The President of the Institution, who occupied the chair, said that when he saw Sir Ewart Smith the previous evening and told him a little about the speeches made at the Plenary Sessions on Friday, Sir Ewart shook him by the hand and said "Good-bye, I'm going!" but a couple of split pins and a rivet or two had succeeded in holding him. He needed no introduction to the Conference; he was a great friend of the Institution, and what they would hear from him would be thoroughly up to the standards already set.

SIR EWART SMITH

I feel very honoured to be asked to address you on this occasion. Also, I feel extremely humble, because whereas you are specialists in this field of productivity, I am just a general practitioner dabbling in the same field. But, because I am a general practitioner, I hope that you will permit me to put forward some general points, which I believe to be of importance in dealing with this problem of productivity which is common to us all.

In these remarks, I may state the obvious; if so, forgive me. I may say things with which you disagree; if so, that is all to the good provided that you are prepared to put forward constructive alternatives. I shall state what I believe to be true, but I admit straightaway that I may be wrong in whole or in part. The way in which I find my own ideas changing, almost week by week, and certainly year by year, is only to recognise that neither I nor, I believe, anybody else can yet approach the absolute; all that we can do is to seek after it.

This reminds me of the old story of the professor who was taking leave of his class. He thanked them for being a good and attentive class, and told them that he had tried to teach them all he knew

THE INSTITUTION OF PRODUCTION ENGINEERS



Sir Ewart Smith

Photograph by L. E. Broome

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but he added : " Gentlemen, I have a confession to make to you ; only half of what I have told you is true ; but it is much worse than that, because I do not know which half is which ! "

LACK OF BALANCE IN WORLD ECONOMY I should like to start by looking for a moment at the world economy, which seems to me to be so obviously out of balance. One of the major features of this disequilibrium is that the general management in the world is out of step with the advance of technology. By the term general management I mean literally that—political and economic, as well as technical. This lack of balance lies between science and the application of science on the one hand, and our ability to control the results of science and technology on the other.

To my mind, the problem the world has to face is to ensure that with progress we get proper continuity—in other words, that we have true evolution. With the advances which are being made in technology, it should surely be possible to have conscious evolution, and to keep the scientific and sociological sides in balance. Inevitably our plans for deliberate evolution and development can only be tentative, for plan how we will, we may plan wrongly. Our approach must be experimental, but it can also be deliberate with proper objectives in view at each stage.

This demands that we face squarely the problem of passing on knowledge from one generation to the next. The difficulty of doing so is increasing year by year with the ever-growing flood of knowledge. It is, of course, quite obvious that the individual grows up to a peak of efficiency and then declines and dies. An organisation, whether it is a country or a firm or any other form of human association, has within itself the potential for perennial renewal, because it is continually taking in fresh individuals to replace the older ones it is losing. The problem is how to ensure that the new men coming in start, as far as possible, where the old ones leave off, and that the collective wisdom of the organisation as a whole is maintained and extended in each generation.

It is not an easy problem, but it is one to which from both the industrial and national aspects we must give a great deal more attention. To my mind, a first consideration of top management should be the selection, training, education and bringing on of the younger generation as being of the utmost importance in effecting ordered evolution.

IMPROVEMENT IN INDUSTRIAL EFFICIENCY Leaving that world problem—and it is a problem as well as a detailed one—let me turn to the main task which we in this country have to face at the present time, namely, the continuous improvement in our overall industrial efficiency. We all realise now that the key to our economic

position and standard of life is our overall productivity or output per man-year. I should like to emphasise, however, that this problem, which we as a nation did not clearly realise and appreciate a few years ago, has been creeping up on us for a very long time.

Productivity, as we were saying last night, is relative, as all things in this world are relative. What matters at any one moment is not our absolute volume of production, but our production per head in comparison with world standards. In the long run, it is the average rate of change towards higher production and higher efficiency which determines our position.

In this connection it is both fair and proper to compare our position with that of the leading industrial nation of the world today—the United States, because only seventy to eighty years ago we were ahead of them, but today they are quite obviously ahead of us. Why the change? Being wise after the event, I say that this change has been due to the fact that, over that period, the United States have improved their productive efficiency at the rate of approximately 3 per cent. per annum, while we have advanced only 1½ per cent. per annum, i.e. at half their rate. You will notice that these rates of change are at compound interest. That difference over seventy years leads to a situation where their output per head is, in round figures, about 2 to 2½ times ours.

I admit straightaway that no measurement of overall productivity can be strictly accurate, but from available statistics it is possible to get a reasonable indication of trends. If you take steel, which is basic to any industrial activity, you will find that, in spite of fluctuations, the long term trend shows that the Americans have been sustaining a rate of growth per head of the population about twice our own. If you take electricity, it is exactly the same result. If you take a relatively new product, such as plastics, and plot it out as a long term trend, you will find exactly the same story; and so it goes on. There are exceptions, of course; shipbuilding is an outstanding one, and thank Heaven it still is so, for as a maritime nation it is especially important that we should be able to hold our own in this vital industry.

NECESSITY OF SELF-EXAMINATION

Why has there been this big differential in our relative rates of development? Immediately this question is asked, there are people who at once jump to the defensive. They say, "Look at the American advantages," and try to excuse what we have, or have not, done. I know full well, after listening to the speeches this morning and attending one of your Groups last night, that this will not be your approach. If a man falls into debt, it may be that he starts to blame circumstances and everybody but himself for his unsatisfactory condition. It is not until he comes to realise that the fault lies within himself

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that he has a hope of recovery. Even if the example is not strictly apposite, it is a good approach for individuals, industry or nations, because it leads to self-examination and will induce further efforts instead of excuses for not taking action, or reasons for putting the blame on others.

Whether we are dealing with a small unit of industry or with a big one, the essential thing in this matter is for us to watch our rate of change. It is the rate of change which counts, because whatever we do we cannot double our productivity tomorrow ; we can only proceed by patient change and evolution towards such an aim.

The Reports of the Productivity Teams which have visited the United States are, to me, a striking set of documents, and I was delighted to see the emphasis which has been put on them at this Conference. On the broad issues they all say much the same thing, and the teams are each unanimous. That is very striking. They all say how much there is that we can do, but to get it done we, as managers and we as a people, must have not only an intellectual belief in the possibilities, but, in addition, an emotional urge to do it. Intellect and emotion must be linked together to get the drive which is necessary and which, I believe, is possible.

**COMPARATIVE
ADVANTAGES**

I read with the greatest interest Mr. Walter's speech, and I agree with every word of it. He suggested very tactfully and very delicately that, although his country had certain advantages, perhaps they were not as great as some of our apologists tended to assume. I do not think that America has in fact greater advantages than we have. The United States has to buy copper, rubber, wool and oil from abroad just as we do. We can buy them just as well if our production is high enough and efficient enough for us to be able to pay the world price. The Americans have a big market, but as a natural market, it is only three times ours. It is a market which is split into a number of very widely separated geographical areas—the West Coast, the South, the Middle West, the East. Within these groups many industries are largely self-contained, so that with a few exceptions, the average size of their production units in manpower is similar to our own. We should remember also that, although the motor car industry is concentrated round Detroit and sells on a continental market, it is not typical of all American industry.

Because of high productivity, America has made her industrial market which on a population basis is three times greater than ours, six times greater ; but we could make similar progress if we cared to do so. Look at the advantages which we have in our compact geographical position at the centre of world trade routes, with all our factories within easy reach of the sea and of each other. Look at our unrivalled transport network, provided we use it properly

with modern equipment. Look at our people with their innate and traditional ability ; a homogeneous people, who are keen, able and energetic when properly led. Look at the advantages that we have, and do not let us always excuse ourselves by pointing out the advantages which the other fellow has, and saying that is why he beats us. What natural advantages has Switzerland in achieving her highly successful industrial development ?

**TRUE
MANAGEMENT IS
THE SOLUTION**

The key to this issue is management. It is no good blaming the man who works on the floor of the shop if things do not go right. He, of course, has his part to play, but how well he plays it will depend in the main on how he has been treated in the past, and how he is being treated in the present. Often, when we discuss these matters, I am tempted to draw attention to the effects of change of management which were exemplified so clearly in the late war. I refer particularly to the Eighth Army and the Fourteenth Army. Here were two groups of men, who, up to a certain point, had had varying fortune ; they had experienced as many reverses as victories ; certainly, they did not feel that they were starting to carry everything before them. Then there was a change of management, and those same men, under much the same conditions, just went straight ahead in a way that the enemy were quite unable to stop. That was management !

It is the same with some of our industries, which quite obviously are not very efficient, and where the atmosphere is not very good. The men in those industries are of the same flesh and blood as the men in other industries which are showing much better results in the national interest. I suggest that the difference is primarily due to past and, to a lesser extent, to present management. When I say "management," I use the term in the widest sense. I do not refer merely to the director or shop manager ; I include the trade union leader, because in this sense of energising people and getting the right thing done, he too is a manager. I am referring to the political side also, because by the background conditions which those on the political side provide for industry, and by the incentives or disincentives which they give in their monetary policy, they also are part of management. I refer, therefore, to management in the widest sense.

That brings me to the point that we cannot have good management unless we have proper education for it. The belief has been growing on me year by year that management is now becoming a science as well as an art. It is rather like medicine. You do not make a doctor in these days just by letting him copy some other leech, but by teaching him the best existing knowledge in a university, followed by a proper period of clinical experience. Of course, a doctor does not become an effective medical man just by

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his academic training ; he has to have practice. Whether ultimately he becomes a good doctor will depend on how well he is taught and on his own innate ability and keenness.

A SCIENCE
AND AN ART

I think that management is reaching a similar state of development. It has progressed from being an art—and medicine not so long ago was just an art—to being a science and an art. I think that our American friends realised this very much sooner than we have done in this country. I think we are now beginning to realise it, and I am not afraid of teaching management, provided it is recognised that merely because a man has attended classes or lectures, it does not make him a manager.

This matter is becoming increasingly important with the growing complexity of our industrial life. Today we hear more and more about specialisation ; indeed, with the ever-spreading bounds of knowledge, specialisation becomes ever more essential. But, just as we develop more specialised segments in the total sphere of knowledge, so we must recognise the need for training and educating the right type of people to link together the various specialist functions. We have to train for integration as well as for specialisation. We have to study and thereby know our people. If in the short span of human life we are to bring up people who are capable of grasping these complexities and dealing with them; we have to catch those people young. We have to study them. We have to see whether a man shows aptitude for specialised activity, or whether he shows more aptitude and inclination for the work of general co-ordination and management. That is not saying that one is more important than the other ; both are necessary and complementary.

If we are to get the people that we want ultimately for top management, it means that the people who are going to be the general managers of the future must be moved round from one type of job to another. They must be given as much responsibility as possible while they are still young and formative. Some may fall by the wayside, but, unless we do that, we have no hope ultimately of getting the higher management we want. I use that term not merely in its industrial sense, although on the industrial front we have a golden opportunity to lead the way. Unless we proceed on these lines, we shall not get the type of organisation, the quality of management and, therefore, the results which are essential if we are to do our duty by our country and by our fellow men.

OBJECTIVE
AND METHOD
ANALYSIS

I believe profoundly that this sort of approach must be based on the analysis of objectives and methods. I understand that the keyword of this Conference is " How," but I venture to add the words " What " and " Why "

as being equally important. What do you want to do? Question it. How do you propose to do it? Question it. Why do you propose to do it that way rather than some other way? If we could drill into the whole of our people, and particularly into management, those three words, and if we all worked to them, we should go a long way. With due respect to our American friends, these are good old Anglo-Saxon words which in the past have carried this country a long way. We should pull them out again and use them on every possible occasion.

Let me, taking my own medicine, apply this analytical approach to some of the main factors upon which, I believe, productivity depends. I should like to start by making a broad split into two obvious categories, the first covering the material and the technical aspects, and the second the psychological side, which includes those intangible things—the mind, the spirit, the emotions—which come in immediately you begin to deal with human beings. Both, I want you to observe are governed in the long term by the quality of management and leadership.

MATERIAL AND TECHNICAL ASPECTS Let us start with the material and technical aspects and analyse them broadly into its various parts. First of all, productivity on the technical side depends clearly on the raw materials and the services which come into an industrial process. It depends on their nature, their quality and their availability. Getting the necessary supplies, however, depends in very large measure on the ability of management to anticipate shortages, and to know whether a particular use of a particular material is wasteful and liable to limit productive efficiency in the future.

An obvious case is that of coke, of which there is at the present time an actual shortage. It is a shortage which, even if we build more coke ovens, is likely to persist as a long term problem, because the supply of coking coal in this country is running down. It is no good waiting until we are faced with a disastrous shortage of this vital material. We must start doing something now. We must research and plan on a long term technical basis to meet situations of this kind. In other words, management must be alive to its responsibilities and take effective action.

I want to emphasise, therefore, that in all these matters the prime factor is management. Difficulties with raw materials are in no way the responsibility of the workmen.

APPLICATION OF RESEARCH RESULTS Secondly, efficient and up-to-date processes depend on the application of knowledge derived from research, which in turn depends on the whole general policy and approach of management. I have myself worked in a research department, and I believe profoundly in the need for

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research. I do suggest however that it is quite useless to go on piling up knowledge for its own sake, unless the drive and the ability are there to apply its results to the service of man.

There was an article by Dr. R. L. Meier in the May issue of "Research" in which he confirmed the oft-repeated statement that this country is good at research, but not so good at application. It was an objective examination, and I think that all of us in the industrial field would agree that, as far as basic research is concerned, we know that it is true. That does not mean that we do not want research in industry ; of course, we do ; but we must insist that the application of research is kept in balance with fundamental research.

For this purpose we need more people on the production side who can talk the language of research, who can take what the scientists produce and understand what they are after, who can visualise, as a scientific engineer should be able to do, what may be the benefits and the possible uses of a particular development. But again, whether research in industry and in the universities is in balance with application or not is a matter of management, a matter of analysis and a matter of taking an objective approach.

Thirdly, among these factors I take the amount of equipment which we employ. Quite clearly industry is a matter of tools as well as of men. This again is dependent upon management policy ; on how much money has been ploughed back in the past, and how far such ploughing back is to be allowed to continue in the future. Again it is a matter of management—not forgetting the political side.

**EFFICIENCY OF
PLANT AND
EQUIPMENT**

The fourth factor is the efficiency of the plant and equipment employed. This is not to be confused with quantity, and should be examined separately. I can think of some industries—there is one not very far removed from Lancashire—where a considerable amount of old equipment is still in use. In that same industry there is a growing amount of modern, automatic equipment ; but is the automatic equipment fully used on three shifts and, if not, can it be right to run the old equipment with its very much lower productivity ? This raises very difficult issues, but it is again a matter of management in a wide sense, involving the Companies, the Unions and the legislators.

**PRODUCTION
VOLUME AND
CONTINUITY**

Fifth among the factors affecting productivity is the volume and continuity of production. This, to my mind, is a most important factor, and one which we in this country have been a little slow to understand and appreciate fully. It brings in, of course, the whole background of standardisation, simplification and specialisation. It gives any amount of opportunity for excuses ; but when we remember that

the average size of the industrial unit in America is no bigger than in this country, we realise that the oft-repeated excuse that the large American market encourages mass production whereas our market does not, is just not valid in most cases.

In this matter you as Production Engineers, have a particularly important part to play. Standardisation and simplification are not simply the concern of the design engineer on the one hand or of the commercial man on the other. If this matter is to be dealt with effectively, there has to be overall integration by general management in the strictest sense of the word.

Because this country started industrially in what was in effect the hand age, there has been a tendency for us over the years to send out our commercial people to sell whatever a firm *can* make. I believe that our friends across the Atlantic—because their industrial growth has occurred primarily in the automatic machine age, bringing with it the realisation of the need for continuity—have tended to send out their salesmen to sell a carefully defined range of products which the firm intended to make with maximum efficiency.

These two approaches lead to quite different results. Please do not infer from what I am saying that I am criticising all British industry. I am not criticising in the ordinary sense of the word at all; I am trying to analyse in an attempt to be constructive. I think that, as a nation, we are now realising the importance of these things, but we have a very long way to go. If we recognise this and take the appropriate action, we can develop our economy at a much faster rate than at present.

**EFFECTIVE
USE OF
MANPOWER**

Sixth and last of these material factors is the use of manpower. The effective use of manpower depends clearly on managerial planning and control, as well as on the actual physical effort which is involved.

The point I want to emphasise is that we should be well advised, in our approach to industrial efficiency, to consider all the factors and not to concentrate unduly on any one of them. If you take the first two factors—the raw materials on the one side and the nature of the processes on the other—you will note that any improvement is likely to be a long term affair. It has to be done and, because it is long term, it should be going on all the time. As you go down the list, however, and particularly when you get to the last two items, you find that short term improvements can be achieved with the expenditure of little capital and without undue difficulty, provided always that management and workers at all levels are educated to do what is necessary.

For convenience the first or long term examination may be called "process study" to distinguish it from the shorter term

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examination now becoming known as "work study." The latter involves method study (motion study where applicable), work measurement and incentives.

IMPORTANCE OF THE INDIVIDUAL So far I have said little about the effort of the individual worker in industry, and that is clearly an important factor in relation to productivity. There is no doubt room for improvement among workers in many cases and at all levels—in this sense all of us in industry are workers. It must be stressed, however, that increased physical effort, in particular, has a limit, whereas the technical and organisational aspects of production have no obvious limit at all. By all means let us attempt to improve in every direction, including harder work, but let us see things in perspective and not regard increased manual effort as the main key to higher efficiency. In some industries that may in part be true at this stage, but not in the longer term.

Turning to the psychological factors, I should like to start by repeating Napoleon's dictum that the moral is to the material as three is to one. I am not prepared to argue about the arithmetic, but I am a profound believer in the general truth of that dictum. Coming, then, to the psychological factors, there is the general attitude of all concerned, which I feel is very largely dependent on management and leadership, both past and present.

There is the question of the springs of thought and action which govern everybody. Mr. Walter emphasised in his address that in America competition is one of the mainsprings of thought and action. I certainly agree that competition is, and can be, a most powerful incentive, but I should like to go beyond competition in the crude sense to the desire to do something that is worth while *because* it is worth while. The understanding, the interest and the pride of the individual in his work, or of the organisation in its work as a whole, are absolutely fundamental in this connection. We must develop a keenness to advance and to win, not because we are going to lose something if we do not, and not necessarily because we shall gain something material if we do, but simply because it can give us back something of the attitude and satisfaction of the old craftsman ; put in illogical terms, it can go a long way to make work fun.

I have referred to two of our Army Groups in the last war. Some of you may have been in those Armies and may be able to tell me whether I am right or wrong, but we all know from our own experience, whether in the Services or in industry, that this sort of psychological attitude can be created and developed. In large measure it is self-feeding. Particularly is it self-feeding if top management has the idea that this is the right approach and if then we bring on the younger men and inculcate in them these same ideas.

THE BASIC PHILOSOPHY

While on this subject I should like also to touch on what I believe is of fundamental importance in all industrial work—that is the need for us to have, as organisations and as individuals—some basic philosophy on which we can found our thought and action. For it to be effective, such a philosophy must be simple, so that even the simplest of us can understand it. It must be logical. It must be positive, and therefore progressive. It must, if it is to be effective, appeal to the moral and social sense as well as to the purely material desires of the population.

I should like humbly to put before you the skeleton of what I believe that such a philosophy should be. I believe that we should start by defining what is the purpose of industry; my own answer is that "The purpose of industry is to provide the goods and services which the community requires with a minimum use of real resources." "Real resources" when you analyse that term and apply it to a given set of conditions reduces itself ultimately to human effort of brain and muscle.

That definition automatically contains within itself the implication that there is going to be continuous progress, a continuous increase of efficiency, because with the advance of science and technology, which we all accept as inevitable, we can develop and produce the same results year by year with a smaller usage of resources.

FOUNDATIONS OF INDUSTRY

On what does industry rest for its functioning? To my mind it rests essentially on three blocks of people, with a fourth block coming in to co-ordinate them. Each of these foundation blocks has to carry its proper share of the load all the time if success is to be achieved, like the foundation of any rigid structure. The first of these blocks is, of course, the customer to whom we sell our goods, the user of the products of industry, who clearly must be satisfied if the business is to prosper.

The second block consists of the industrial employees of all grades. I mean all grades, from the whole-time managing director to the office boy and the man who sweeps the floor of the shop. Unless they are satisfied with their job and have an interest in it, that foundation block will not carry its proper share of the load.

The third block consists of the people who put up, in the form of their savings, the capital which is necessary to provide the means of production. They also, if the whole process is to be healthy, must be satisfied, or they will not save. Or, if they do save, they will not lend, because no one is going to save and lend at risk unless there is some expectation of return. We all know that capital can

only come from withholding current consumption ; that is, from saving. We all know the alternative to voluntary savings is compulsory taxation in some form or other.

These three blocks, or partners in industry, can be regarded as management's three customers—the customer for goods, the customer of employment, and the customer to whom is sold service on his capital. The fourth block, management, is there to link them all together, and to organise the framework which enables them to co-operate.

CAPITAL AND THE WORKER In mentioning capital, I should like to mention a little story which I think is useful in dealing with this very knotty problem of profits, dividends, capital and so on. In many industries it costs today between £5,000 and £10,000 of capital to employ an additional man in a new factory. Let us assume for a moment that there is a new factory in which a man is going to work a particular machine, and that the cost of that machine is £5,000. Let us also assume that the life of that machine is expected to be twelve years. That means that if the organisation is to be healthy and to renew itself at the end of that time, it must build up a fund for the replacement of that machine. At simple interest rates for amortisation, that means that there has to be set aside approximately £400 a year during the life of that machine on the assumption—a big one—that money values will remain stable during that period.

The operator of that new machine will probably turn out a good deal more output than he turned out previously with old equipment. Let us assume that his annual remuneration today is in the region of £400 a year, £8 a week. When that operator, by using the new machine, doubles his previous output, he may say : " Why can't my wages be doubled ? " The answer is : " Wait a minute. You have standing at your elbow beside this machine an invisible man who, throughout the whole life of the machine, must have the same wages as yourself, for he has to be housed, clothed, fed and have his children educated. He is an imaginary man, a composite man ; he represents a bit of a man in the mines, a bit of a man in the iron ore mines, a bit of a man in the steelworks, and a bit of a man in the machine shop ; but he is nevertheless a real man who has to be maintained for the whole of that time."

This explanation makes sense, not only to the man on the floor of the shop, but also to management ; because it can be said to management : " If you work that new machine on days only, each operator from his output—and that means you, Mr. Manager, from your output—has to maintain two men—himself and the

invisible man. If you work it on two shifts, each of your operators has to keep only half an invisible man, and if you work it on three shifts only one-third of an invisible man.

I mention that only by the way as the sort of approach which we must have in dealing with our people and in dealing with ourselves. You may accuse me of being too elementary, but I believe that sometimes it is good to reduce our problems to a simple and fundamental form.

The basic purpose of industry which we have been discussing centres round a social aspect, but that does not imply that profits are wrong. Of course profits are necessary and social, whether regarded as a proper recompense to the third block or partner, or to provide seed for ploughing back for future and greater crops. In defining a social purpose for industry which all can appreciate, it is possible to build up a case to show that unless each of the partners in industry is satisfied, and unless they all operate together effectively, the best or even good results cannot be obtained in the interests of all. It can be shown that it is management's job to work for and encourage continuous improvement of productive efficiency for the purpose of raising the standards of life and increasing leisure.

**SHARING
THE CAKE**

I have postulated an increasing cake year by year. The first real difficulty comes when we have to decide how that cake is to be shared between the three blocks. It is my personal view that the major share of that increase should go back to the first block, that is to the purchaser of the goods and services, because all the other partnership blocks themselves come in that first block. In times of stable money values, if you can bring down prices you increase everybody's real income automatically, while in times of inflation it is of major importance to restrain the rise of prices by every possible means. I have no hesitation in saying that this should be our first objective. I would say to those of us who have general responsibilities, whether as industrial executives or trade union leaders, that we should examine our actions carefully to see whether we are doing everything we can to achieve this end.

I believe that with this sort of approach we can make quite clear to all concerned that management and ownership are two entirely different functions. I believe that many of our social difficulties at the present time date back to the days when management and ownership were largely synonymous. Today, that is not true; the two functions are separate in theory, and largely so in practice as far as productive industry is concerned. That is why I believe that the sort of philosophy which I have outlined recognises the moral accountability of management, not to one set of people, but to customers, employees and shareholders alike.

If, in a changing world, real freedom is to survive, it is not sufficient for us merely to defend our way of life, because there are some people who do not agree that it is a very good way of life or realise what it has done and can do for the human race. Rather we must base our thought and action on a dynamic and a moral approach, which is clearly stated and applied. We have so to run our affairs as to generate that latent enthusiasm which can mock at all our difficulties. Those qualities are there in full measure if we care to draw upon them. As individuals, and as a nation, we must educate ourselves and our people to realise that we shall not get the best result as long as we behave as if industry consists of two conflicting sides. On the contrary, it comprises various members of one organic whole, whose interests are really identical. As a nation we must be able to say with Ulysses, and perhaps with an eye on the Chancellor of the Exchequer :

“ Though much is taken and much remains, and though
We are not now that strength which in old days
Moved earth and Heav’n, that which we are, we are—
One equal temper of heroic hearts
Made weak by time and fate, but strong in will
To strive, to seek, to find and not to yield.”

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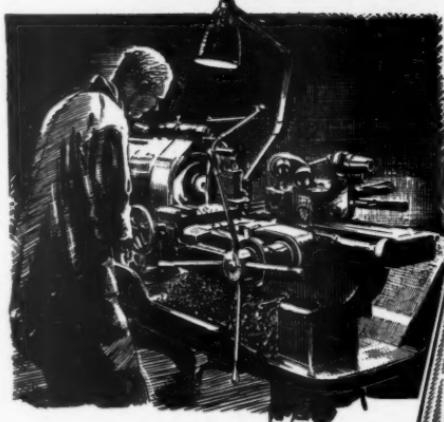
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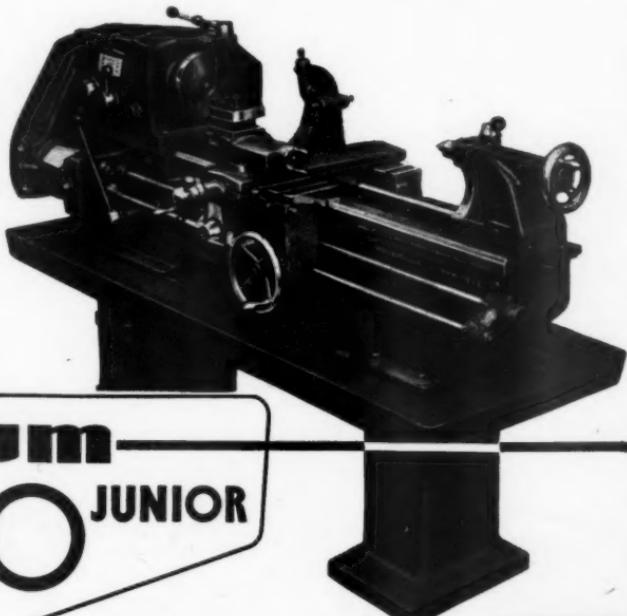
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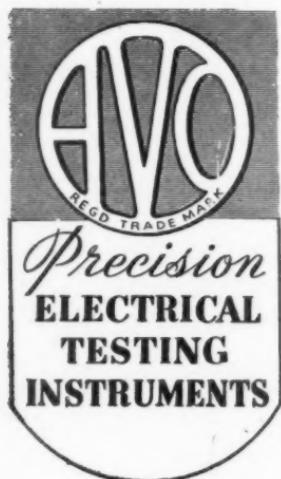
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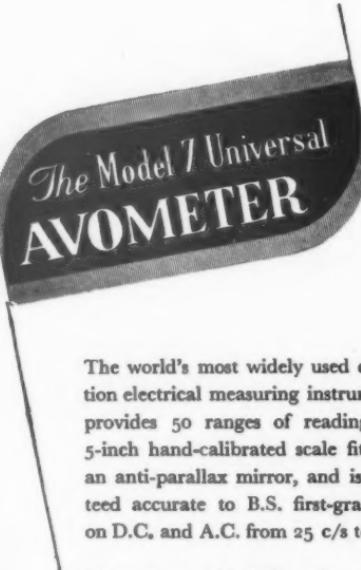


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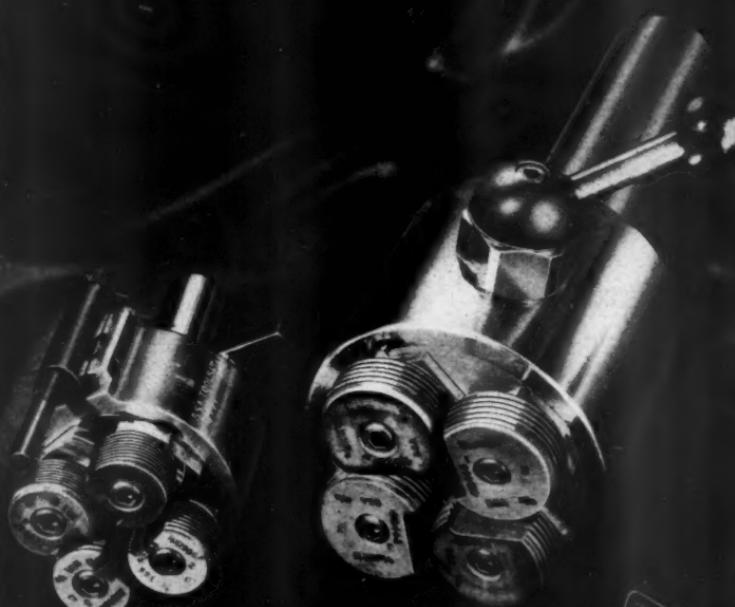
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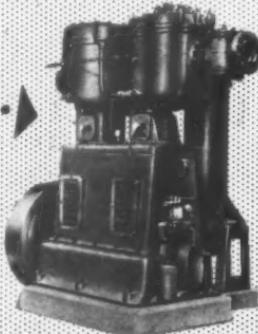
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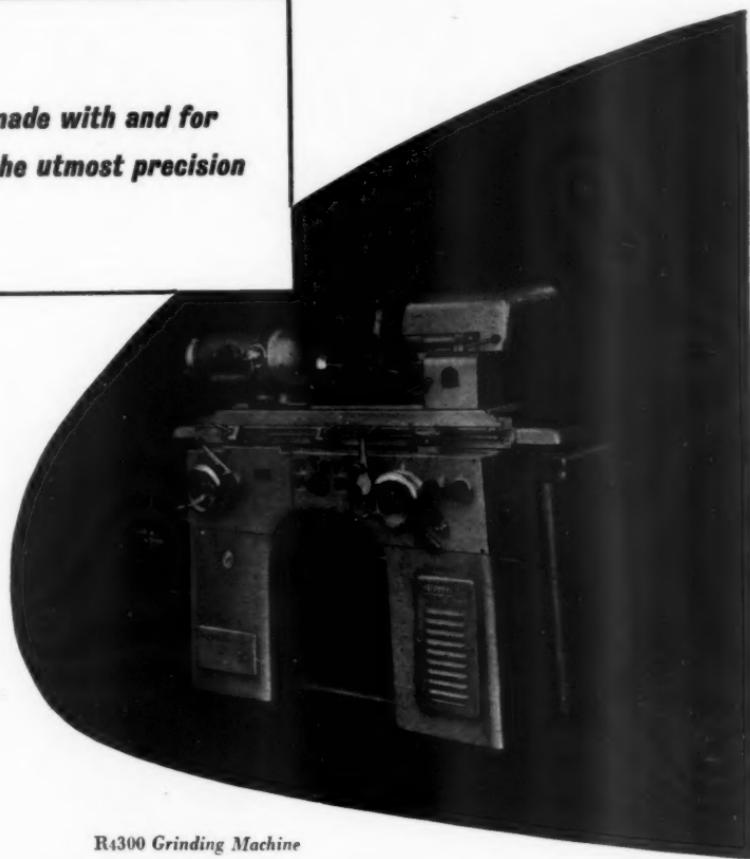
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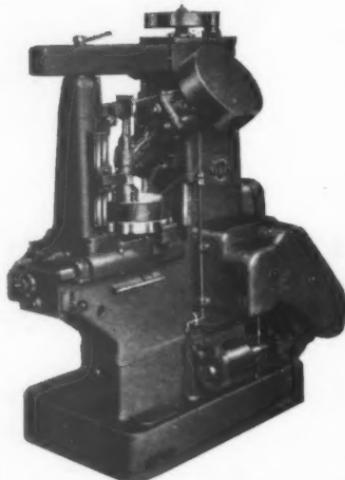
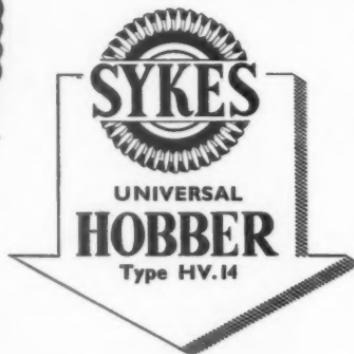
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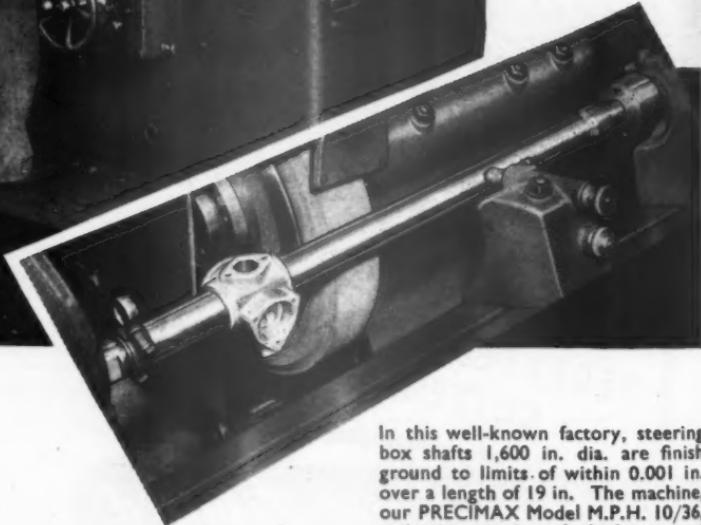
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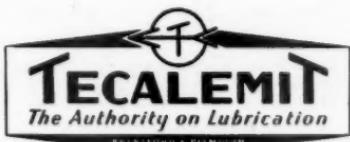
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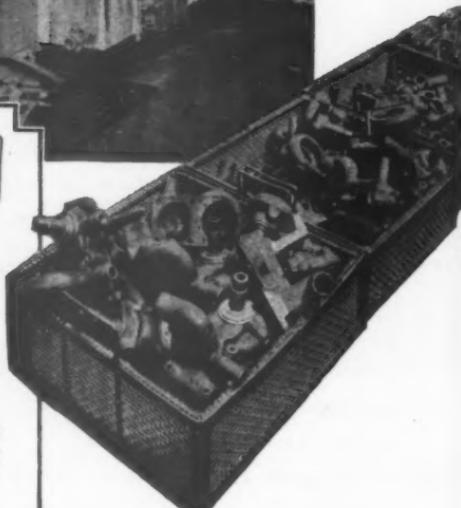
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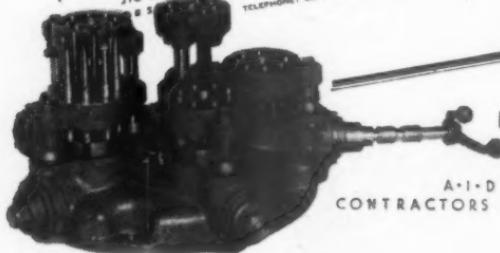
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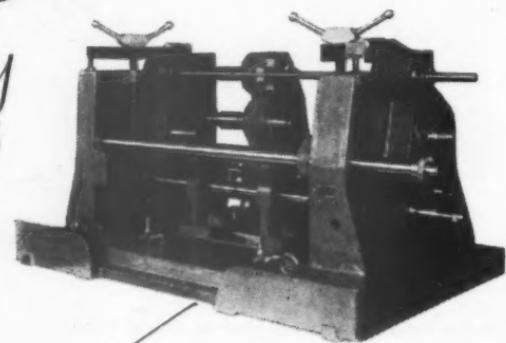


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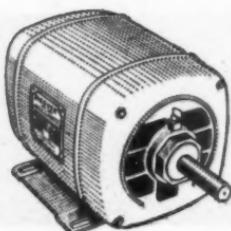
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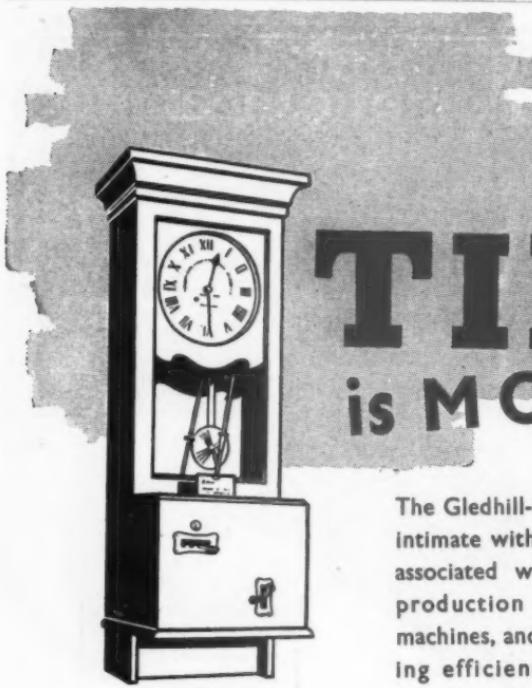
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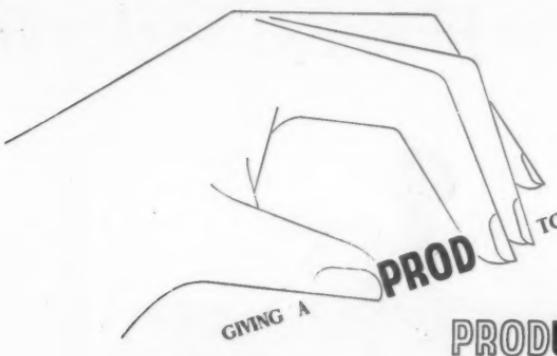
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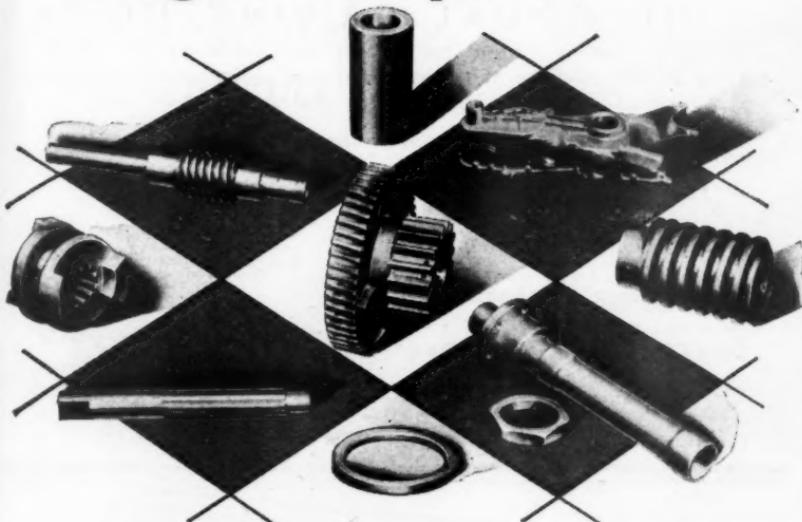
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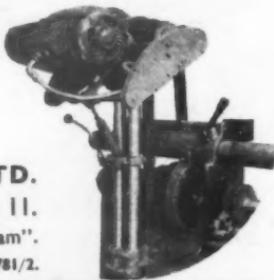
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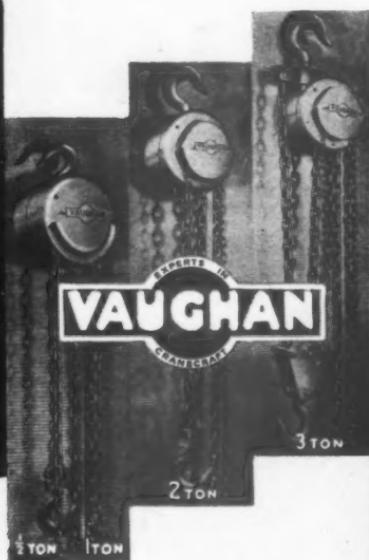
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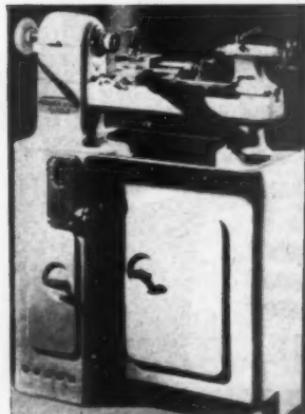
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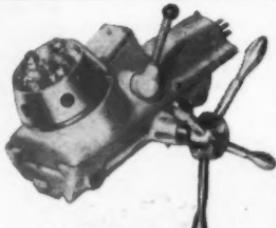
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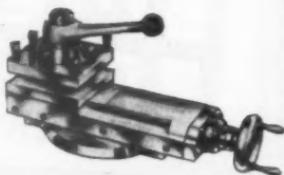
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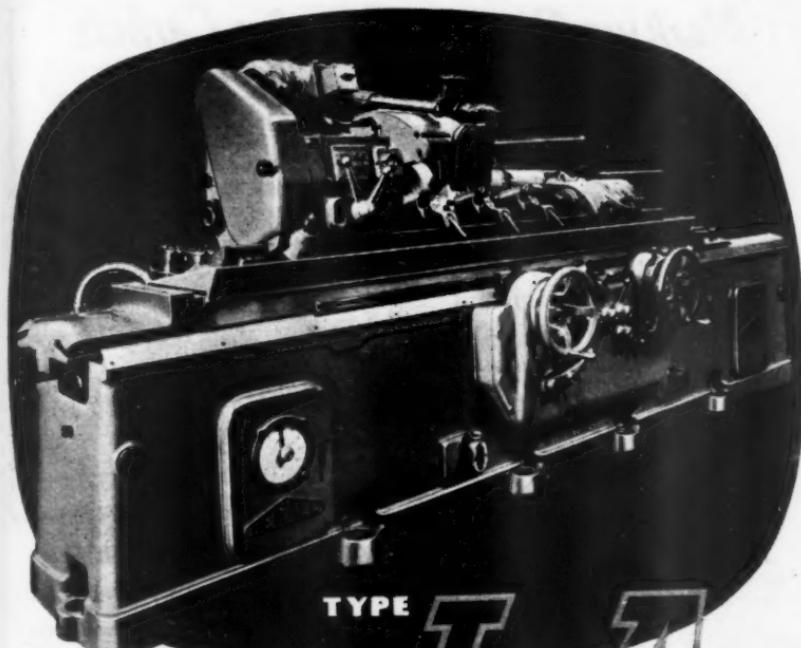


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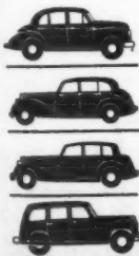
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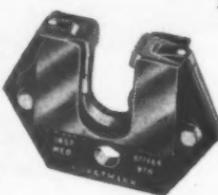
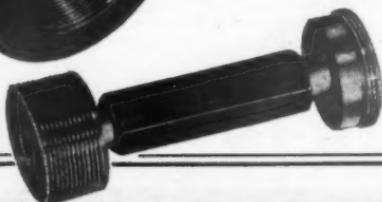
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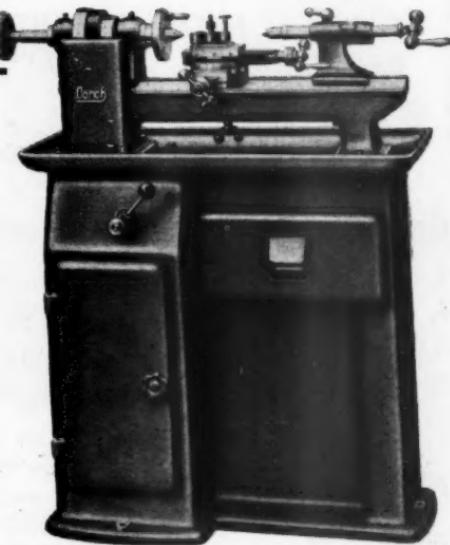
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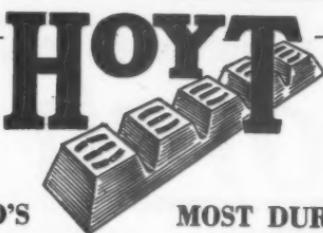
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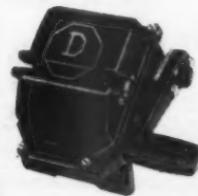
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station.



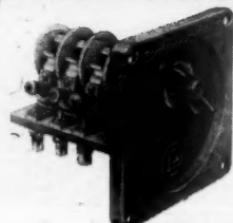
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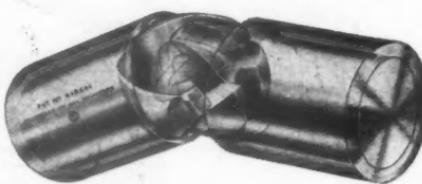
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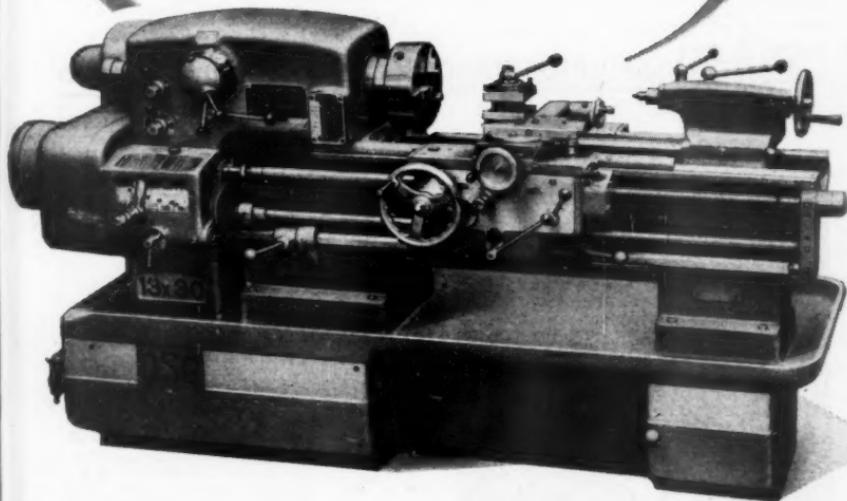
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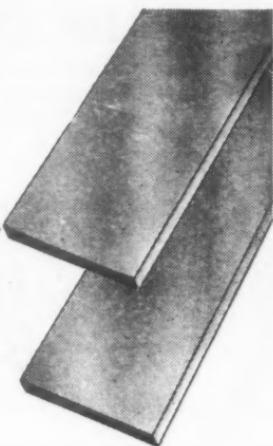


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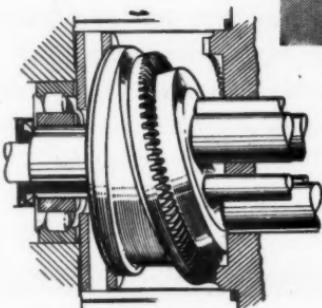


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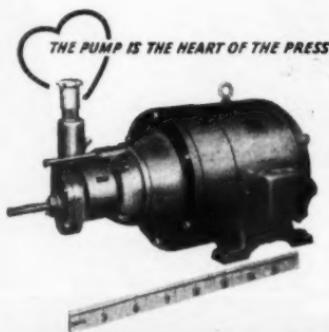
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